Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 21 MARCH, 1914 No. 3

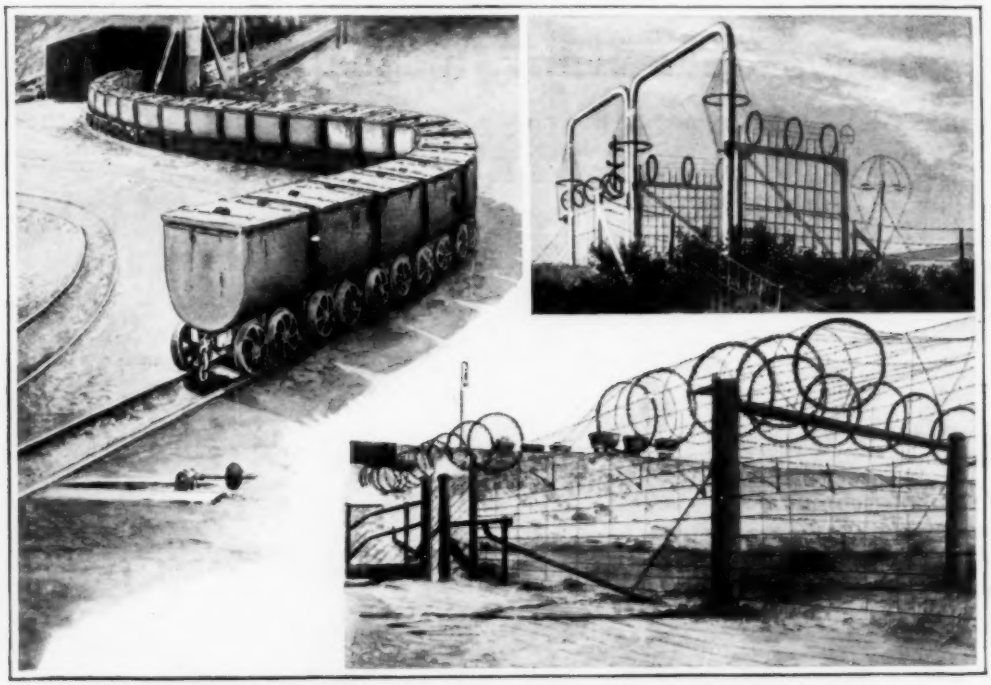
Bayonet Fencing a Soldier's Sport

FENCING with bayonets is the most popular as well as the most dangerous game among soldiers in the regular army. Those who participate must be strong and skillful, the game is not one for weaklings. The regulation outfit is a mask, heavily padded coat and padded gloves. The bayonets used are tipped with rubber, but despite all these precautions, men are often hurt in the set-to. Each regiment has its champions, selected by a process of elimination from the various companies. When these champions meet on one of the field days often held at brigade posts, the rivalry is intense.

Fencing Duel between Regimental Champions at an Army Post

MINING DIAMONDS BY MODERN METHODS

Machinery and barbed wire have supplanted the crude methods of breaking up diamond-bearing blue earth and protecting the valuable finds employed 20 years ago in the South African diamond mines. The depths of the strange crater-shaped hole in which the peculiar diamond-bearing earth is confined, is now penetrated by shafts, reaching hundreds of feet down into the earth, with 40-ft. levels. The broken earth is removed in closed trucks to the surface, where, after a season of exposure to sun and atmosphere strewn on the ground, it is hauled to the mills. Here pulsators finally locate the diamonds on grease-covered inclined tables, to which the diamonds adhere, while loose sand, earth and gravel are washed away by water. Acres of ground, covered by broken earth brought up from the mines, contain possibly millions of dollars worth of gems, and these treasure-troves are protected by high fences of barbed wire, with intricate arrangements at the corners and at the gates. About 4,000 miles of wire are used in the defenses about the Kimberley mines.



Covered Steel Trucks Carry Diamond-Bearing Earth from Mines to Pulsators. The Grounds are Protected by Barbed-Wire Fences with Unclimbable Gates and Corners

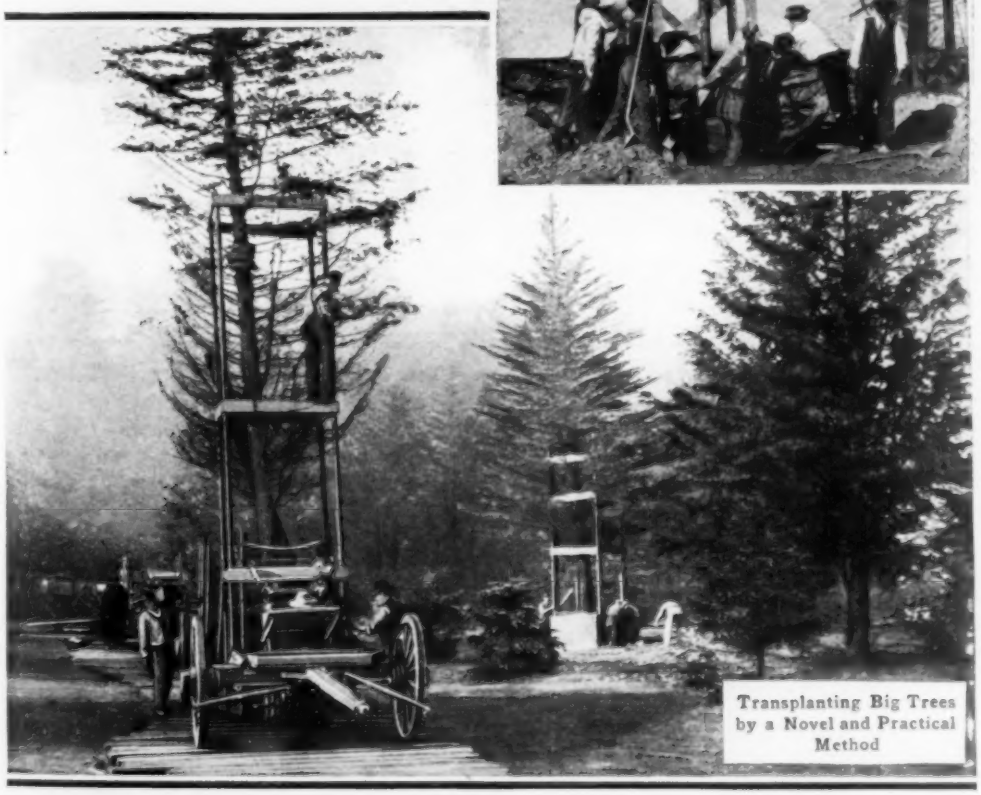
BRINGING BIG TREES TO SAN FRANCISCO

Old trees from India, Africa and the Philippine Islands have been uprooted, transported by elephants, ox teams, horse and mule-power, electricity, steam and sail to the grounds of the Panama-Pacific Exposition in San Francisco. The method employed is interesting, as it was at first thought impossible to accomplish this without a very large percentage of these centuries-old trees dying.

A rectangular cut is made around the base of the tree at some little distance from the edge of the trunk, severing the side roots, leaving the bottom roots only to nourish the tree. Boards are forced down into these cuts to prevent the side roots from growing together again, and the tree is then left

undisturbed for six months. By that time the tree has become accustomed to living through its bottom roots, and these are now severed, and boards forced beneath the tree, which is then pulled over on its side. The boards are then secured into a rough box, wrapped heavily with wire rope, and the tree lifted by derrick to car or wagon, or is hauled to the shipping point by such power as is available.

Hoisted on shipboard, the tree is kept from the light, and when, weeks or months later, it arrives at the exposition grounds it is living, but in a sorry condition. A place having been prepared for it in rich soil brought from forest lands on the Sacramento River, it is replanted under conditions most favorable for its continued growth. The box is removed and the tree carefully nursed for 30 days, by which time it has again fastened its roots into the earth and will, in all probability, live.

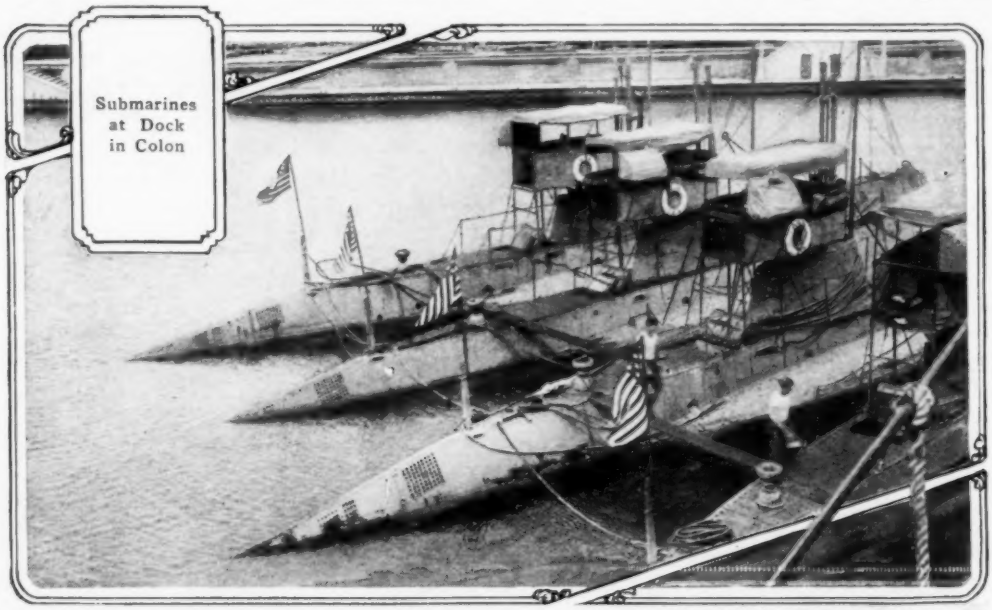


Transplanting Big Trees by a Novel and Practical Method

Great Trees are Brought from the Ends of the Earth to the San Francisco Exposition Grounds

SUBMARINES NOW AT COLON MADE LONG TRIP

Lying at the wharf at Colon, four of the five submarines which are to form a part of the Pacific coast defenses on the Panama Canal, preparatory to their trip through the locks, were photographed after their record-breaking sea voyage from Guantanamo, Cuba. Accompanied by the monitor "Montauk" and a collier, these tiny warships crossed the Caribbean Sea and established a new claim to seaworthiness by their excellent behavior. The Caribbean is notoriously a bad patch of water, and that this flotilla was able to negotiate the distance, some thousand miles, in good order and at normal speed is considered an excellent feat.



Submarines at Dock in Colon

Copyrighted by Underwood & Underwood

IS THE NOSE RING COMING BACK IN STYLE?

A famous French actress contends that wearing a nose ring gives a particularly coquettish expression to the countenance. She has suffered herself to be photographed in support of her views. It is a relief to learn, however, that the ring is simply "stuck on," although, to all appearances, the nose is pierced.

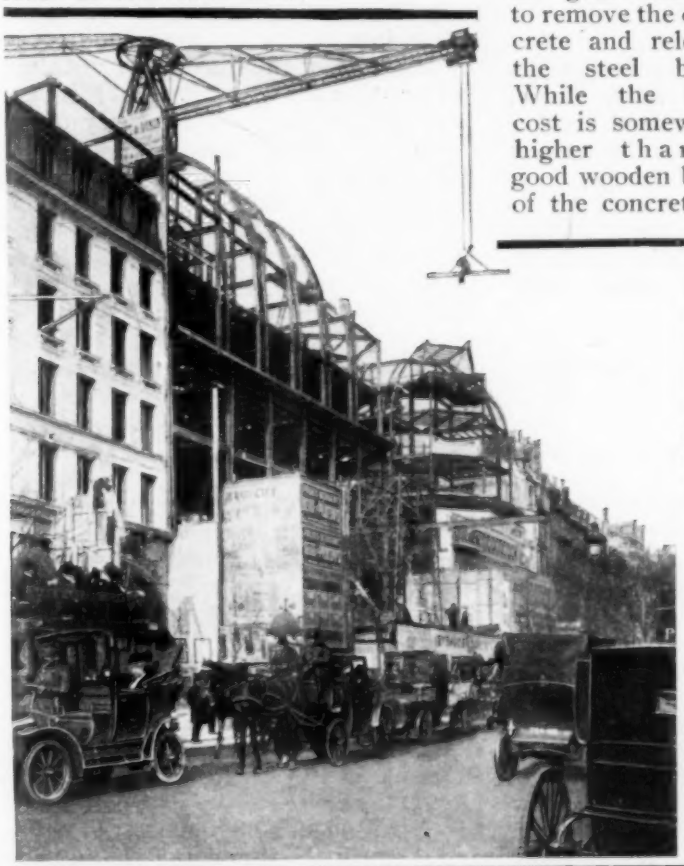
SAFETY LAMPS NOT ALWAYS SAFE

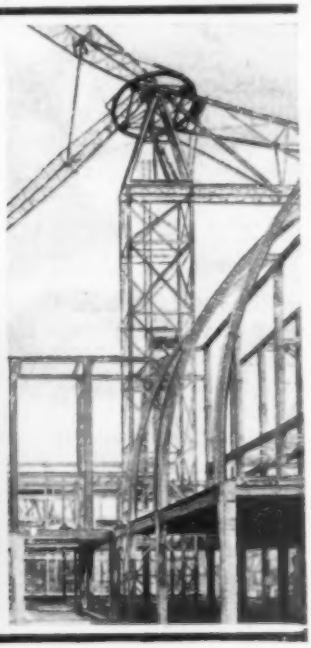
The advent of the electric lamp for use in mines was hailed as the end of explosions, which had been frequent with old-style oil lamps, even when equipped with approved safety devices. But experiments have shown that a small piece of picture wire across the terminals of one of the small two-volt batteries, immediately becomes red hot, and easily lights a cigarette. Even if the battery box is locked and the safety terminals applied, it has been shown that two pins stuck through the cable which connects the accumulator to the lamp will afford such contacts for the current that a piece of iron wire stretched between the pins

will glow, giving enough heat to flash gas. Homemade cigar lighters operated by careless miners from these so-called safety lamps might readily cause disastrous explosions.

FRENCH BUILDING CRANE INTERESTING APPLIANCE

French contractors make use of an ingenious derrick, crane and hoisting apparatus in erecting modern structural-steel office buildings. A trussed arm is supported from a central tower, and pivoted to move in any direction. A movable crane runs upon this arm, carrying suitable hoisting apparatus. The central tower is connected by trussed supports to other and smaller towers, the whole being capable of handling efficiently very considerable loads of structural steel.

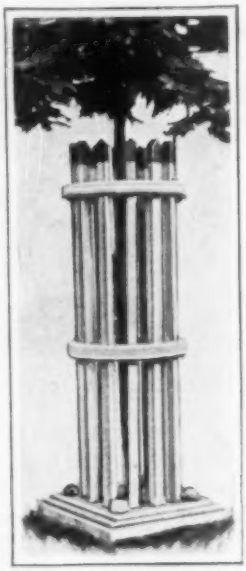




Ingenious Derrick with Movable Crane and Hoist. Right, Trussed Beams Supporting Central Tower

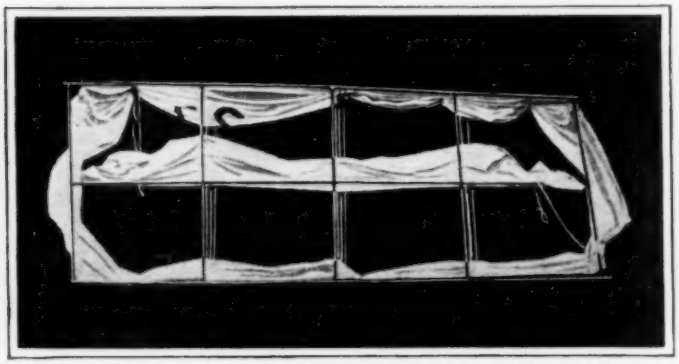
A CONCRETE CASE OF TREE PROTECTION

To protect growing trees with some degree of permanency, the use of concrete has been adopted, reinforced by steel bars and rings, a singularly pleasing design resulting. The concrete tree box lends itself readily to decorative features, and color may be introduced to harmonize with foliage or house coloring. When the tree outgrows its narrow box, it is no great matter to remove the concrete and release the steel bars. While the first cost is somewhat higher than a good wooden box, the lasting qualities of the concrete make it worth while.



COLLAPSIBLE BOX KITES USED BY GOVERNMENT

The United States experts use box kites in many meteorological experiments, but have hitherto found difficulty in transporting them across the country from one station to another by reason of their shape and size. A novel type has been devised which, by cutting a few strings and loosening four bolts, permits the kite to be knocked down into flat, compact form, very much like a collapsible box or carton. Hinged joints are arranged at suitable points and the kite may be erected quickly, without requiring expert knowledge. When ready for shipment the kite takes up but little room and can be easily handled by one man.



New Box Kite Designed by Government Experts for Easy Shipment

WIRELESS MESSAGE SENT TO ARCTIC EXPLORER

Through Canadian government channels a wireless message was sent to Donald B. MacMillan and his fellow explorers at Etah, Greenland, from the American Museum of Natural History. It was a "cheer-up" message of Christmas greeting, and while no response was received or expected, it is believed the message reached its destination. Doctor MacMillan's party is equipped with wireless apparatus, although it is not able to send messages over the 1,600 miles, which separate it from New York.

NAVY PUTS EDUCATIONAL PLAN INTO EFFECT

By a general order promulgated by the Secretary of the Navy the plan for the education of enlisted men, outlined by Secretary Daniels in the September, 1913, number of this magazine, was put into effect at the beginning of the year. The instruction under both academic and technical heads is under the general direction of the commanding officer on each ship, and commissioned, warrant and petty officers will assist the men to improve themselves, not only in learning trades, but in such other instruction as may be needed by enlisted men who have not had the benefits of a good school education. From 1:15 to 2:30 every afternoon, save Saturdays, Sundays and holidays, will be devoted to the self-improvement of every man on the ship. Special attention will be given warrant officers seeking commissions, petty officers striving for warrant rank, and enlisted men who are now taking correspondence courses in outside institutions.

TURKISH POSTAGE STAMP COMMEMORATES VICTORY

A new series of postage stamps was issued by Turkey in commemoration of the recapture of Adrianople, which bears an artistic representation of the mosque of Selim II, the finest structure in the city. Turkey has not issued many artistic stamps, and the new series is out of circulation, being used for only one month.

BLIND TO HEAR PRINTED CHARACTERS

The fact that metallic selenium is a better conductor of electricity when light shines upon it than when in the dark, is the basis of numerous experiments looking toward ameliorating the condition of the blind. A recent invention called an optophone consists of a box containing a checkerboard group of selenium cells, each connected with a modified telephone receiver which is applied to the ear. When a printed page in large type, as a poster, is passed in front of this instrument in a strong light, each cell in the group will sound a musical note in the receiver, and the blind man may detect the letter from its note or chord. The letter A, for example, when passed in front of this instrument gives a rising and falling scale, while the middle bar maintains the note for a perceptible instant. The blind man quickly learns to distinguish this combination of sounds as A, and in time to memorize the alphabet. Refinement of the process may, possibly, revolutionize the whole field of teaching the blind.

STREET-RAILWAY TRANSFERS COUNTED BY WEIGHING

In many street-railway offices transfers are now counted by the simple and rapid method of weighing. All the transfers to be counted are dumped on the main pan of the scales. In place of the usual weight, a pan containing a given number of transfers, usually 25, is slid along the bar for securing a balance, the relative weight of the transfers in the two batches is thus determined, and from this the number of transfers in the batch being weighed is secured.

HOT SPRINGS OF ICELAND MAKE NATURAL LAUNDRY

In Iceland hot springs boil up out of the earth and are utilized by housewives for washing their clothes. At Reykjavik the springs are railed off as a measure of precaution, for in the past women have slipped into the boiling water and lost their lives. Iceland is of volcanic origin, earthquakes are not infrequent, and the hot springs are constant reminders of the thinness of the shell which separates the frozen land from internal fires.

Washing Clothes at Iceland's Hot Springs

SEARCHLIGHT MAKES SHIPS IN WAR COLOR VISIBLE

That the war color of naval vessels was selected because of its invisibility by day rather than by night, is the statement recently made by a naval officer, and tests seem to show that a vessel painted in this color, while difficult to see in daylight, is easily picked up and made visible by a searchlight at night. In one case a vessel painted in the war color was detected at a distance of 17,000 yd. under the searchlight. There seems to be an insuperable difficulty in connection with this. For night work alone black is believed to be the best color, but this is a color too easily distinguished in daylight to be considered.

DEVICE BEATS TIME FOR CONGREGATION

An unique contrivance designed to beat time for congregational singing has been installed in a Vineland, N. J.,

Light Aids Congregation to Keep Time

church. It consists of a circuit attached to the lighting system, the switch being operated from the footboard of the pipe organ. When the organist's foot presses the bass pedals the crossbar is pulled by rawhide thongs, and opens and closes the circuit in perfect time with the music. A light is placed in front of the choir loft connected with this switch, and flashes rhythmically in plain sight of the congregation.

¶For the purpose of communicating with the fire commissioner's office the fireboat "James Duane," of the New York fire department, has been equipped with wireless and it is planned to install similar equipment on the entire fleet of 11 vessels.

FAIL TO WIN PRIZE FOR NEW MOTOR FUEL

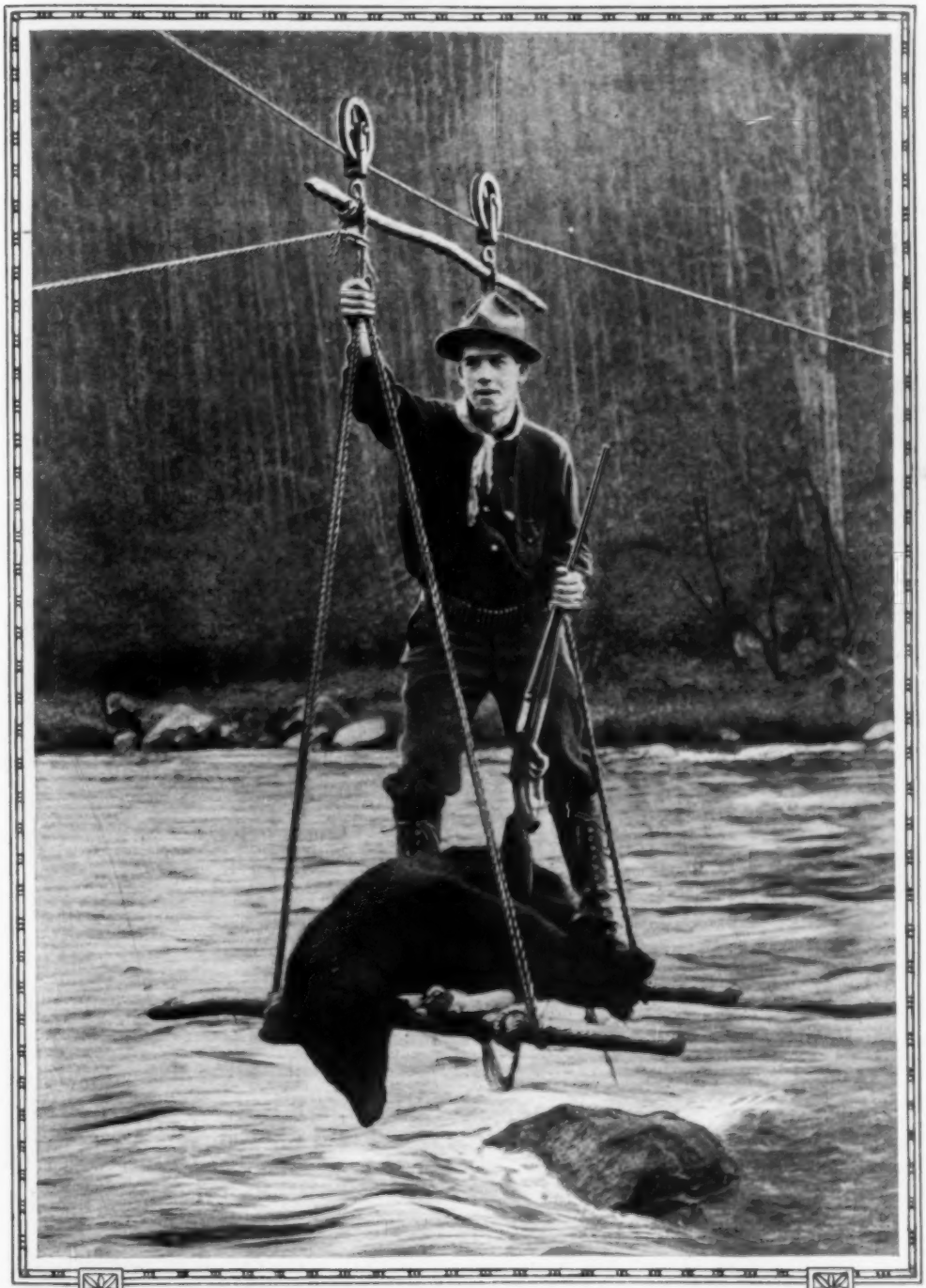
An English society offered a prize of $10,500 some time since, for a fuel which would replace motor spirit by a less costly fluid. Thirty-eight papers from competitors living in eight countries were received and referred to an eminent scientist, upon whose recommendation, however, all were refused, none of the applicants having succeeded in complying with the conditions.

BREAKING STONE WITH CANNON BALL

A cast-iron cannon ball, weighing 3,000 lb., was used by a contractor to break up masses of rock at a quarry near Pittsfield, Mass. It was hoisted by a derrick boom, and a jerk of the cord released it. The workmen became quite expert in this and the rapidity

A Cannon Ball Used for Peaceful Task

and efficiency of its operation made it available wherever the contractor had blasted rock to break up.

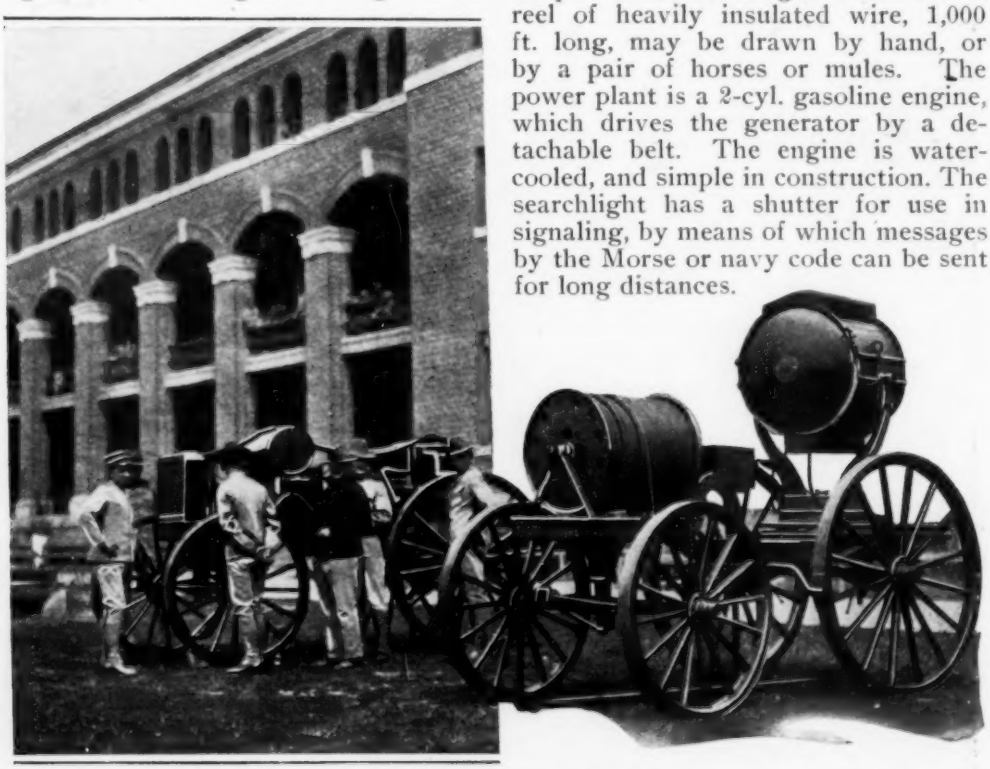


Every Year During the Hunting Season Sportsmen Flock to the Slopes of the Adirondacks for the Big Game That Abounds in That Region. Formerly it was Often Necessary to Abandon the Result of the Day's Sport on Account of the Difficulty of Transporting It across the Turbulent Streams, on Which it is Difficult to Handle a Boat of Any Kind. This has been Overcome at One Point on the Sacandaga River by the Erection of an Improvised Aerial Railway across the North Branch of This Stream

Photo by Underwood & Underwood

PORTABLE SEARCHLIGHT FOR U. S. MARINES

A 40-in. searchlight, mounted on a light truck, and a gasoline engine and dynamo on another, form a compact lighting plant for exploration and signal purposes, now a part of the equipment of the United States Marine Corps. The searchlight itself and a reel of heavily insulated wire, 1,000 ft. long, may be drawn by hand, or by a pair of horses or mules. The power plant is a 2-cyl. gasoline engine, which drives the generator by a detachable belt. The engine is water-cooled, and simple in construction. The searchlight has a shutter for use in signaling, by means of which messages by the Morse or navy code can be sent for long distances.



New Lighting Equipment for Marines

STREET-CAR HEATERS CAUSE PEAK LOAD

That the current used by the electric heaters of street cars is one of the most important factors in the total amount of current consumed in a big city during the winter is indicated by charts showing the relative consumption in Chicago on cold days and on the "dark days" by which that city is occasionally visited. Comparison of the chart for a clear day and for a day when it was almost as dark as night, the temperature being about the same on both days, shows that the average consumption for the dark day was about 10,000 amperes greater than for the clear day during business hours. All this excess is attributed to the operation of lights, as the power and heating requirements would be about the same in both cases. The record load for the month, however, occurred on a clear day when the temperature was low, and it was apparent that this excess load was caused almost entirely by the consumption of current by the electric heaters which are now exclusively used in the street cars.

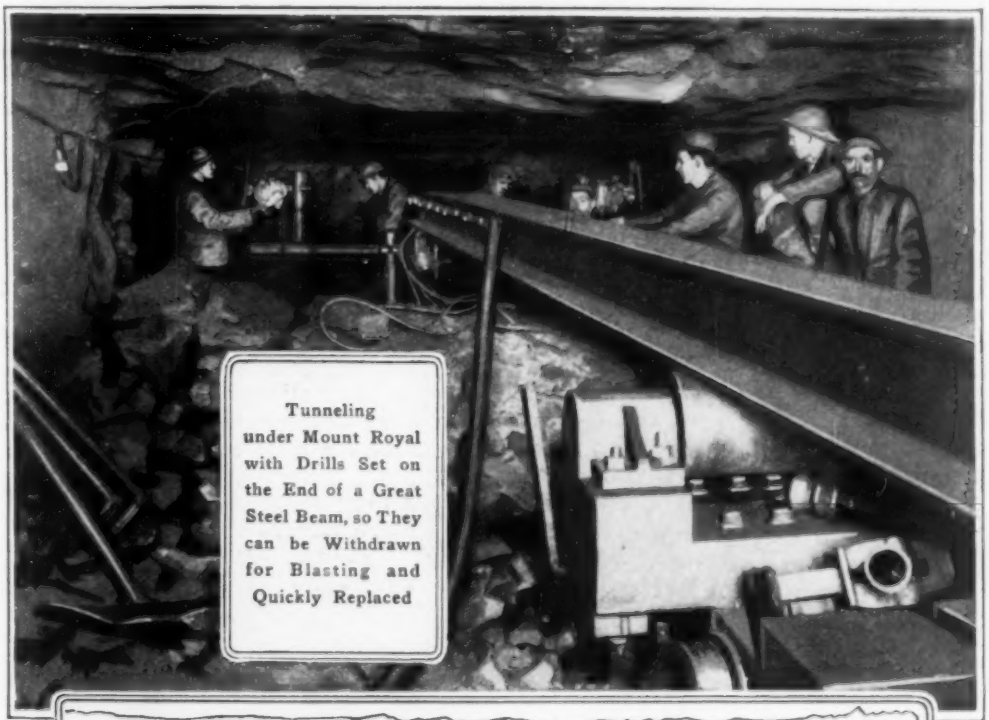
¶The use of chemical extinguishers for fighting forest fires has not proved very successful. Forest officers, in explaining this fact, say that the unlimited supply of oxygen in the open tends to neutralize the effect of the chemicals.

IMPROVED METHOD USED IN TUNNEL BUILDING

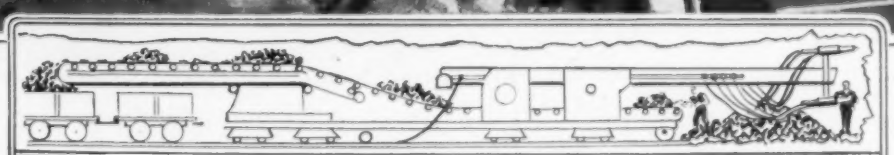
In the two-mile Mount Royal tunnel, completed last December, gangs working from either end joined headings after 17 months, by the use of a new method of handling drills. Usually drills are applied to the face of the rock and borings made sufficiently deep to plant the dynamite cartridge, when the drills, which weigh 80 lb. apiece and more, are dragged back by main force out of the danger zone and the charge exploded. The drills are then dragged forward, and again applied to the rock. This entails an immense amount of extremely hard labor. The Montreal engineers, however, mounted the drills on a horizontal bar, connected with a steel beam on a carriage running on steel rails, which could easily be run back 20 ft. After the shot was fired, the beam was run forward, and an endless chain carried out the "muck," or broken rock.

NEWSPAPER MADE FOR USE AS WRAPPING PAPER

Two days each week a daily paper published at Eberswalde, a Prussian town near Berlin, is printed on only one side of the sheet, and on these days the paper is made twice as large as usual so that the public loses nothing in the way of reading matter. The object of this curious arrangement is to make the paper useful as well as instructive, as it can then be used for wrapping up provisions without any touch of printers' ink.



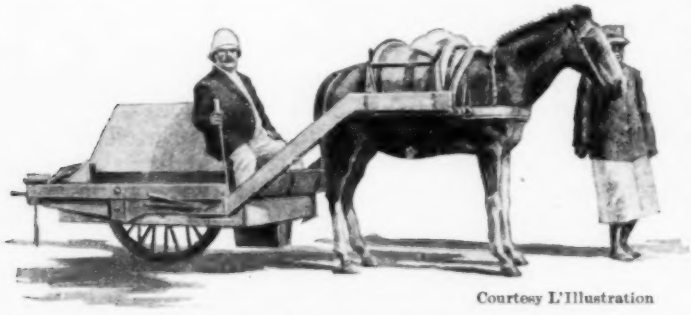
Tunneling under Mount Royal with Drills Set on the End of a Great Steel Beam, so They can be Withdrawn for Blasting and Quickly Replaced



Horizontal Bar with Drills, and Endless Chain Loading Rock on Cars

SINGLE-WHEELED TRUCK FOR MADAGASCAR

A truck of novel design has been constructed by a French official in Madagascar, consisting of a metal body with but one wheel. In spaces on either side of the wheel a load of approximately one ton may be carried. The flat, stiff shafts serve to keep the truck balanced and the harness is so arranged that any kind of a draft animal may be used; ox, mule, or horse. With two men in charge, this truck is capable of supplanting 40 native bearers. The body is water-tight and can cross shallow watercourses without damaging the load.



Courtesy L'Illustration

Practical One-Wheel Truck for Use in African Brush

BUILD NEW TUNNEL TO CUT DOWN AIR RESISTANCE

When a train moves through a tunnel the resistance of the air is an important factor, experiments having demonstrated that it measures 13.86 lb. per ton of train weight in the Simplon tunnel, as against only 8.8 lb. in the open air, a difference of over 50 per cent. This is when the train is running at 37 miles an hour in the direction of the ventilating air current; when running in the opposite direction the resistance increases to 20.46 lb. These facts point out the significance of the new tunnel, costing some $9,000,000, which is now being built and will parallel the old, with numerous cross tunnels connecting them, to promote an equilibrium between the air masses in the tunnels, and thus reduce the resistance.

ELECTRICITY WILL DETECT FRAUD IN MAPLE SUGAR

Granulated sugar at less than 5 cents a pound is similar to maple sugar retailing at four times that price, but the flavoring and the color is so small an amount that the identification of granulated sugar in maple sugar is not easy. However, a Canadian scientist has employed electricity to detect adulteration, and as pure granulated sugar offers a certain definite resistance to the passage of electric current, and maple sugar offers a different resistance, he finds it a mere matter of reading the ohmmeter to determine the purity of any sample.

CANARY BIRD DETECTS BAD AIR

The canary has been found to be extremely susceptible to the presence of carbon monoxide, the dreaded "white damp" of the coal mine, and rescue parties from the Bureau of Mines now take with them cages containing these birds, when penetrating entries and chambers in search of injured or dead miners. A small proportion of the white damp in the air causes the canaries great uneasiness, and close observation of the actions of the birds enables the rescuers to retreat before being themselves overcome by the gas.

Rescue Party in Mine Using Canaries to Test Air

SIGN WARNS THOUGHTLESS MASTERS

Bicyclists, motorcyclists, and automobilists who own dogs, sometimes fail to remember that dogs cannot keep up

Photo by Paul Thompson
Sign Speaks for Doggie

with men who ride the flying wheel. An English society is distributing signs bearing the appeal: "Remember, You Ride, I Run!"

CO-OPERATION IN STUDY OF WIRELESS

Wireless telegraphy has enabled the French and American authorities to determine within the one-hundredth part of a second the difference in time between Paris and Washington. The interchange of signals between the Eiffel tower and the radio station at Arlington will be continued, and experiments and studies will be made in such subjects as the photographic registration of wireless signals and the velocity of wireless waves. In carrying on this work the two governments exchange officers, so that there are always some French naval officers at Arlington and some American naval officers at Paris.

THE MIGHT OF THE MOONLIGHT

Sleeping in the moonlight in the tropics is attended, so it is said, with danger. There is an affliction called "moon blinks," which has been traced to the reflected light of the moon, caused by polarization of reflected light. This has no connection with the one-time popular superstition that sleeping in the moonlight caused insanity, whence came the name "lunacy." One scientific publication concludes that the bad effect observed in fish exposed to the rays of the moon may produce sickness in humans.

GREAT WALL OF CHINA IN PERFECT CONDITION

Few people realize what an almost perfect condition prevails along a large part of the great wall of China. The bricks of the parapet are as firm as ever, and their edges have stood the severe climatic conditions of North China with scarcely a break. The paving along the top of the wall is so smooth that one may ride over it with a bicycle, and the great granite blocks with which it is faced are smooth and as closely fitted as when put in place over two thousand years ago. The

The Great Wall of China Still Well Preserved

entire length of this wall is 1,400 miles, it is 22 ft. high, and 20 ft. in thickness. At intervals of 100 yd. or so, there are towers some 40 ft. in height.

HUNTING THE BIGGEST OF ALL BIG GAME

By ROY C. ANDREWS

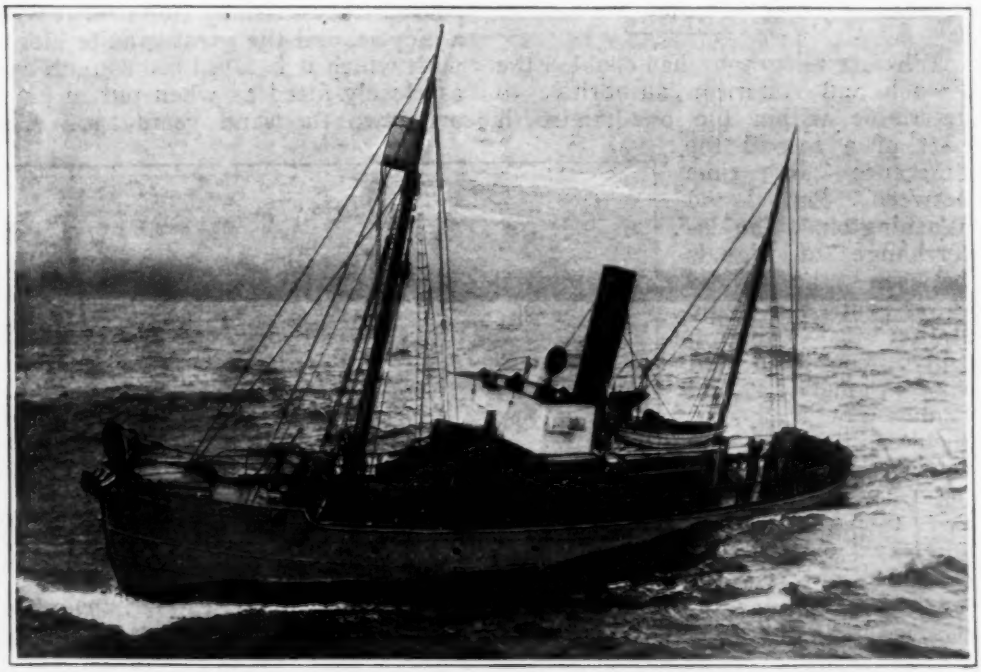
Assistant Curator of Mammals, American Museum of Natural History

Illustrated with Photographs by the Author

WITH the perfection of the harpoon gun, invented by Svend Foyn, a Norwegian, began a new era in the history of whaling. This invention has made possible the capture, in tremendous numbers, of the fin whales, animals which had been little troubled by the men who hunted in a small boat with a hand harpoon and lance, because their great speed and tendency to sink when dead, as well as their thin blubber and short, coarse "whalebone," or baleen, made them difficult and unprofitable to kill.

Svend Foyn discovered that by mounting a small cannon, which shot a heavy harpoon, upon the bow of a small iron steamer the fin whales could be killed in sufficient numbers to warrant the erection of stations at certain places upon the shore near the feeding grounds of the animals, where the huge carcasses could be hauled out of the water by means of a steam winch and converted into commercial products. These shore stations proved so immensely profitable that within a few years they had been erected in almost every part of the world where conditions were favorable—in Newfoundland and Labrador, Alaska, British Columbia, Washington, Oregon, Mexico, South America, and the islands of the Antarctic; on the coasts of Japan, Korea, Africa, and Russia. Australia has recently been invaded; in New Zealand humpback whales are being taken in wire nets, and so in nearly every part of the globe the world hunt goes on. But it is from the stations on the South Atlantic islands that the greatest fortunes are being made today.

It was only after years of experimenting that the harpoon gun of the present time was evolved. This is a short, heavy cannon, 51½ in. long, with a 3-in. bore, and is mounted upon a swivel which works easily up and

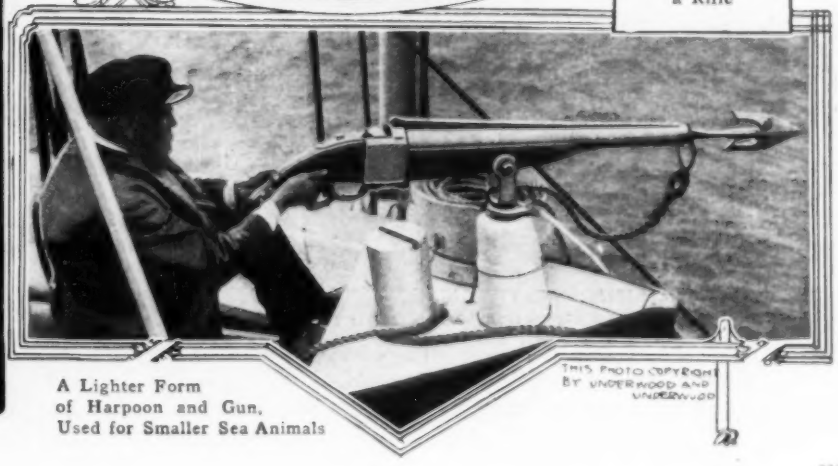


A Modern Steam Whaling Ship, with Harpoon Gun Mounted in the Bow

The Modern Harpoon Has Four Barbs and an Explosive Head

The Harpoon Line Passes through the Platform to a Winch

Aiming at a Whale. The Gun must be Sighted Like a Rifle



A Lighter Form of Harpoon and Gun, Used for Smaller Sea Animals

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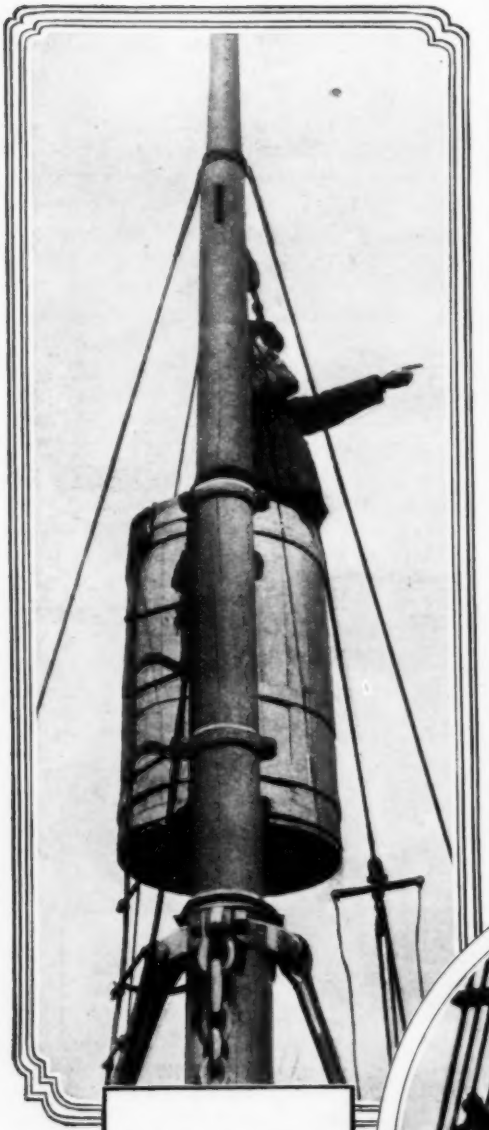
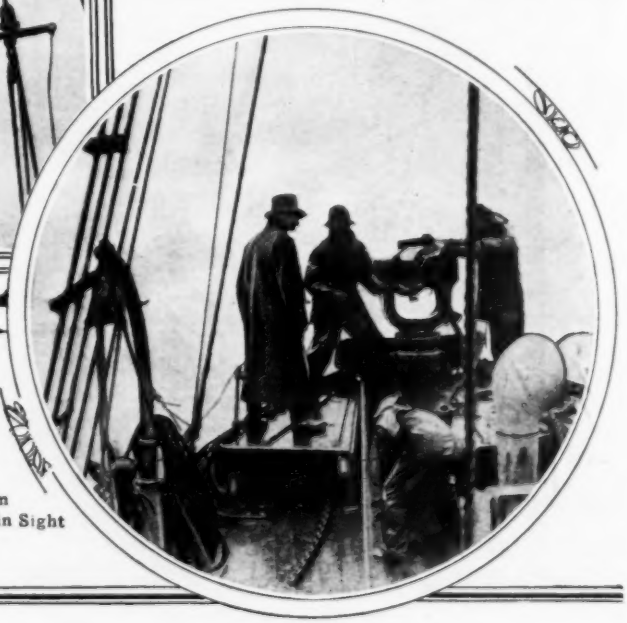


Lookout in the "Barrel" Sighting a Whale

down and from side to side. At the butt end a short wooden handle projects, under which is an iron lever, the trigger. The charge is 300 to 375 drams of very coarse black powder, which is sewed up in a cheesecloth sack and rammed in from the muzzle; then come wads of oakum, hard rubber or cork, and wool, after which the harpoon, well greased, is pushed in and hammered solidly into place with a wooden mallet. Some guns require more powder than do others, but if too much is used the harpoon will be bent when leaving the muzzle.

The gun is effective to a distance of 150 ft., but few whales are killed that far. Generally the animals are shot when not more than 60 to 90 ft. away, and at this range the gun is as accurate as a rifle and must be sighted almost as carefully.

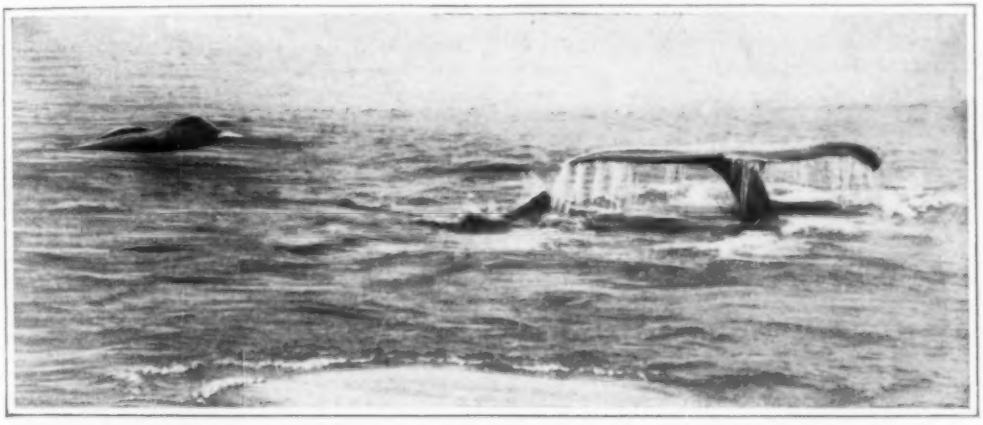
The harpoon is 76 in. in length and has a double shaft, at the end of which are four 12-in. flukes, or barbs; these spread and prevent the iron from drawing out of the whale's body. The tip of the harpoon is a hollow point, called the "bomb," which is filled with powder and ignited by a time fuse; three of four seconds after the discharge of



Loading the Harpoon Gun While Awaiting a Signal from the Lookout That a Whale is in Sight

the gun the bomb bursts, often killing the whale almost instantly. The best Swedish iron is used in the construction of the harpoon and it weighs about 110 lb. After it has been fired into the body of a whale it is usually badly bent and twisted, but the tough, elastic iron can be straightened by the station blacksmith and made as good as new.

A large wire ring slides freely along the double shaft of the harpoon, and to this one end of a rope is fastened.



"There She Blows!" A Humpback Whale Diving and Another Whale Close By

The main line measures 5 in., but 250 to 300 ft. of a somewhat smaller rope, called the "forerunner," are coiled upon a heavy iron pan just beneath the gun, thus giving slack to be carried with the harpoon as it flies through the air. From the pan the rope passes backward over a roller in the bow of the ship to a double winch, just forward of the bridge, and down into the hold where 3,000 ft. or more are carried. By means of the winch the whales are "played" as one would use a reel on a fishing rod, and after they have been finally killed are hauled to the surface and fastened to the side of the ship.

The harpoon lines are made of the finest Italian hemp and tested for a breaking strain of 18 tons, but the forerunner for 15 or 16 tons. Some lines, made especially for hunting the great blue whales, are tested as high as 28 tons. If a tight line is kept when fast to a whale, and there are no sudden jerks, the ropes seldom break, but during a heavy swell, if the line suddenly slacks away, I have seen it part like whipcord.

The whaling steamers are trim, high-bowed vessels of about 100 tons burden, 90 to 100 ft. long, and have a speed of from 9 to 12 knots (10 to 14 miles an hour). Round-bottomed to facilitate speedy manipulation, they ride the water like a cork, but roll and pitch tremendously in the slightest seaway.

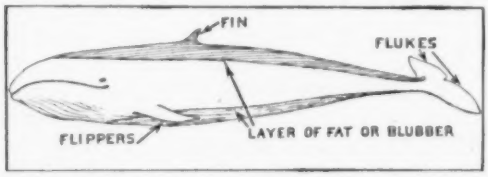
Not far forward of the winch the single mast is stepped, bearing near its head a small barrel. The man in this "crow's nest" can see far over the water and, if it is smooth, down into it, often sighting a whale, which is rising to blow, several seconds before it reaches the surface.

Both the captain, who is usually the gunner, and the crew of 10 or 12 men live below decks, the former occupying a small but comfortable cabin aft and the latter the forecastle forward.

As soon as a whale is sighted at sea the vessel is headed at full speed straight for it. When close by, some captains will "lie to" with engines stopped, waiting for the animal to rise again, while others prefer to steam slowly in a wide circle about the spot where the whale went down. If the animal rises near enough for a shot, the gunner waits until the maximum amount of its body is shown above the

water and usually fires just as the dorsal fin is appearing above the surface.

Often the harpoon will be driven into the flesh for its entire length and, in fact, in one instance when I saw a small finback whale killed, it went com-



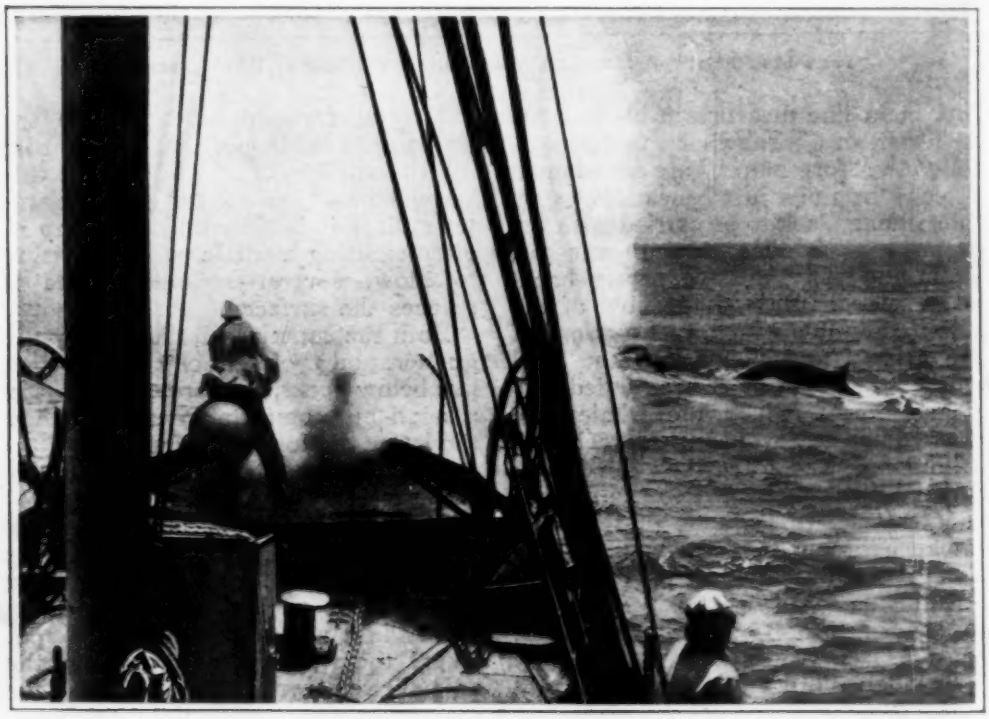
Outline of a Whale Indicating the Various Parts

pletely through the body. If the iron penetrates the thoracic cavity and the bomb explodes near the heart or lungs, the animal is killed instantly. Often, however, two harpoons are required to finish the work, and in rare instances even three or four.

As soon as the whale is dead, the body sinks and must be raised by means of the steam winch. When it is at the surface, a leaded rope is thrown under the "flukes," or tail, a chain drawn about them by means of it, and the carcass made fast, flukes foremost, to the bow of the vessel. Immediately a coil of small rubber hose is prepared, one end of which is attached to the air pumps and the other to a hollow, spear-pointed tube of steel with perforations along its entire length. This is jabbed well down into the stomach, the pumps started and the body slowly filled with air. When it has been inflated sufficiently to keep it afloat, the tube is withdrawn and the incision plugged with oakum.

If the whale has been killed early in the day, or there are others near by, the carcass will usually be marked by a flag and set adrift to be picked up at the end of the day's hunting. Several times I have been on board ship when as many as six whales were killed in a single day, and it meant a long, slow tow back to the station even for the powerful little steamer.

I will never forget my intense surprise at the extraordinary ease and

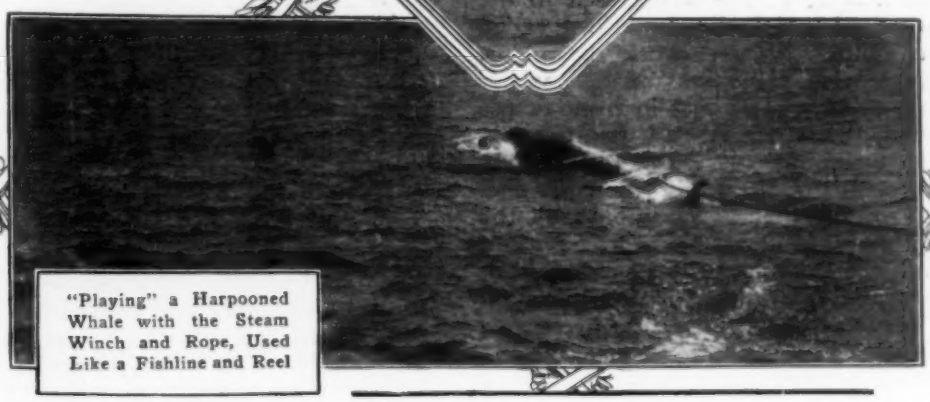


Shooting a Finback Whale; the Harpoon in the Air

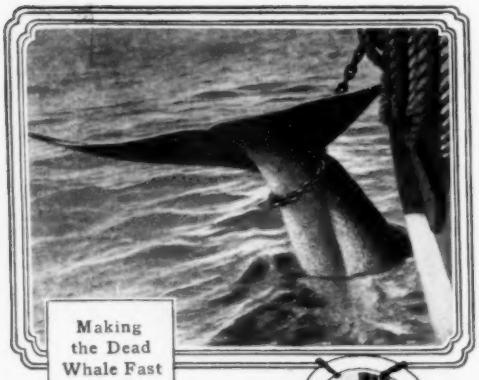
As the Bomb Explodes in the Whale

Another Remarkable Picture of the Firing of the Harpoon Gun

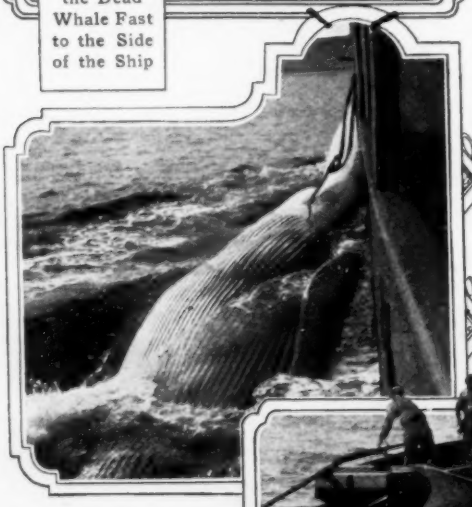
The Harpoon Line Travels in Zigzags and Curves



"Playing" a Harpooned Whale with the Steam Winch and Rope, Used Like a Fishline and Reel



Making the Dead Whale Fast to the Side of the Ship



"Blowing Up" a Fin Whale; Inflating It with Air so It will Not Sink

Cutting Loose the Inflated Whale to Float While the Ship Pursues Others

quickness with which the enormous carcasses are handled by means of the steam winch when I first saw a whale "cut in." Three humpbacks had been left floating in the water, tied to the end of the long inclined platform called the "slip." When work began, a heavy wire cable was made fast to one of the whales just in front of the flukes, the winch started, and the carcass, weighing perhaps 45 tons, drawn slowly out of the water upon the slip. One of the cutters scrambled up the whale's side, and balancing himself upon the smooth surface by the aid of his long knife, made his way forward to sever at the "elbow" the great side fin, or flipper, 16 ft. in length.

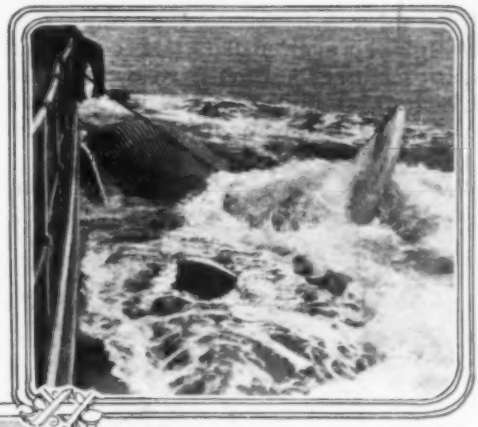
Before the carcass was half out of the water, other cutters, or "flensers" as they are called, had begun to make longitudinal incisions through the blubber along the breast, side and back, and from the flukes the entire length of the body to the head. The wire cable was then made fast to the blubber at the chin, the winch started, and the great layer of fat stripped off exactly as one would peel an orange. When the upper side had been denuded of its blubber covering, the whale was turned over by means of the "canting

"Flagged." The Floating Whales are Marked so They can be Picked Up Easily

winch" and the other surface flensed in the same manner.

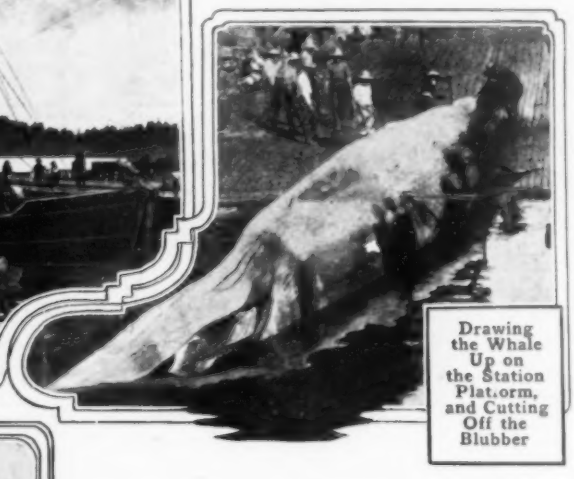
The "blanket pieces," as the blubber strips are called, were cut into large oblong blocks and fed into a slicing machine, chipped into small bits, carried upward and dumped into enormous vats to be boiled or "tried out" for oil.

The carcass had meanwhile been opened by chopping through the ribs of the upper side, a heavy iron hook was attached to the tongue bones at the throat, and the entire mass of heart, lungs, liver and intestines drawn out at once. The body was then hauled to the "carcass platform," at right angles to the "flensing slip," the flesh torn from the bones in two great masses by the aid of the steam winch, and the skeleton disarticulated.



A Big Blue Whale in Tow

Towing the Day's Catch to the Shore Station



Drawing the Whale Up on the Station Platform, and Cutting Off the Blubber

A Sperm Whale Being "Cut In" by the Norwegian Method

Both flesh and bones were piled separately into great open vats, which bordered the carcass platform, and boiled to extract the oil. The flesh was then artificially dried and sifted, thus being converted into a very fine guano, and the bones pulverized to form "bone meal," also a fertilizer. Even the blood, of which there are several tons in a large whale, was care-

fully drained from the slip into troughs, boiled, dried, and converted into fertilizer. Finally the water in which the blubber had been tried out, was used in the manufacture of glue.

A White Whale: This Beautiful and Rare Species is of Little Commercial Value

This, with the exception of minor details, is the method of handling whales which the Norwegians developed after years of experimenting, and which is followed in almost all other parts of the world except Japan.

In the Island Empire shore whaling as a great industry has developed during the last 20 years, but nowhere else in the world are the by-products so perfectly utilized. At the Japanese stations the Norwegian method of handling whales is sometimes used, but the more favored way of "cutting in" is one of their own adoption.

At the end of a wharf extending into deep water, two long, heavy spars are erected, and joined at their extremities by a massive crosspiece, from which the great blocks carrying the wire cables from the winch are suspended.

A heavy chain is made fast about the whale just forward of the flukes, the winch started, and the body drawn slowly upward over the end of the wharf. As it appears, the cutters slice off great blocks of flesh and blubber, which are immediately seized by "hook men" and drawn to the back of the platform. Two other cutters, working from a boat at the end of the wharf, divide the carcass just forward of the dorsal fin. The entire posterior part of the whale is then drawn upward and lowered upon the wharf to be stripped of blubber and flesh.

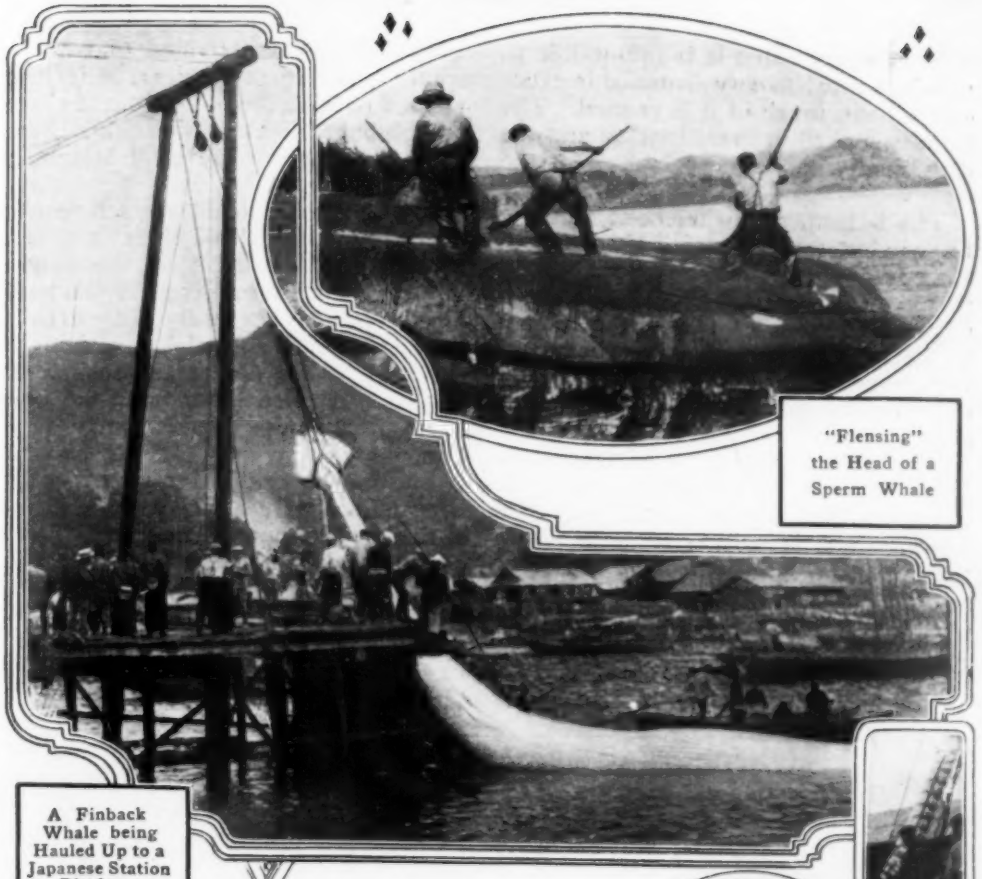
Transverse incisions are made in the portion of the body remaining in the water, a hook is fastened to the blubber, and as a blanket piece is torn off by the winch the carcass rolls over and over. The disjointed head is hoisted onto the pier and, section by section, the carcass is cut apart and drawn upward to fall into the hands of the men on the wharf, where it is sliced into blocks 2 or 3 ft. square.

If a ship arrives at night with a whale, fires of coal and fat in iron racks along the wharf are lighted, and the work of cutting in goes on as merrily as in the daytime, for the meat and blubber must be hurried on board fast transports and sent to the nearest city to be sold in the markets and peddled from house to house.

Few people realize that whale flesh supplies the greatest part of the meat diet of the ordinary Japanese. It is prepared in a variety of ways, but perhaps is most frequently chopped finely, mixed with vegetables, and eaten raw,

The Open Mouth of an 80-Ft. Blue Whale, the Largest Species: The Mouth would Hold 10 or 12 Men But the Throat is Only 9 In. in Diameter

dressed with a brown sauce. Almost every part of the great carcass is utilized for human consumption, even the tendons, heart, liver and intestines being prized by the cooks.



"Flensing" the Head of a Sperm Whale

A Finback Whale being Hauled Up to a Japanese Station Platform

Drawing Up a Gray Whale by the Japanese Method

The Japanese Strip Blubber from Whale as Carcass Rolls Over

Head and Flipper of a Gray Whale

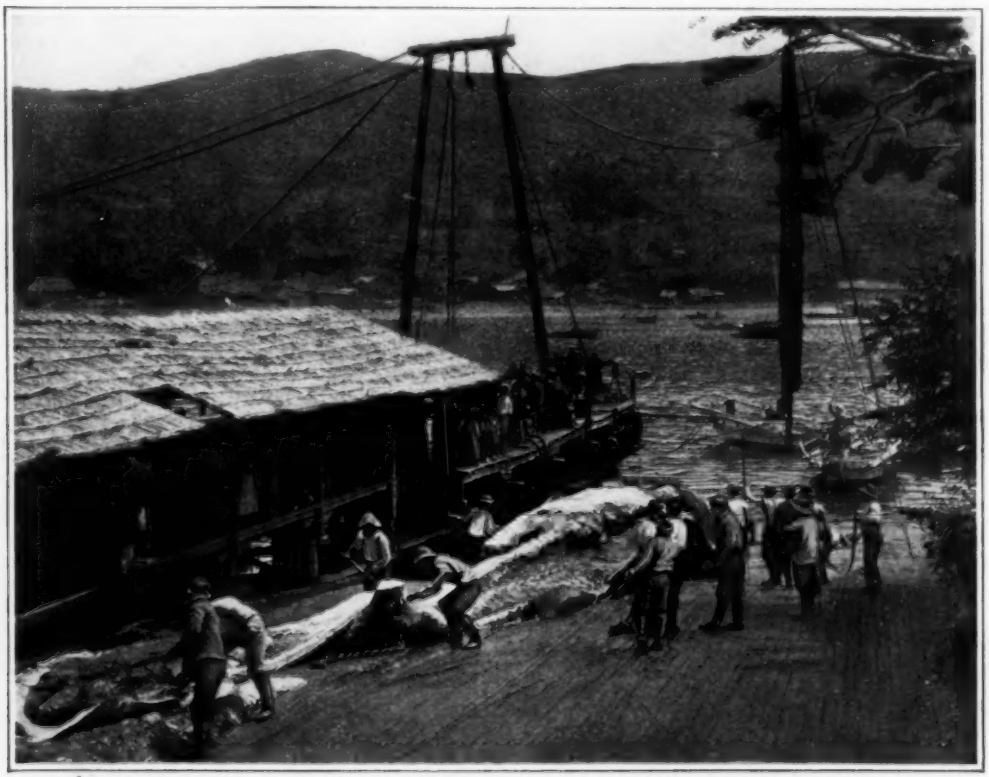
In summer when it is impossible to ship the meat to any distance because of the heat, much of it is canned. The flesh is cooked in great kettles, and the cans made, packed and labeled at the stations.

The baleen, or "whalebone," of the fin whales, which is of little value in Europe and America, has been put to many uses by the clever Japanese. Cigar and cigarette cases, charcoal baskets, sandals and other beautiful things made of this material are in daily use by the natives and are being sent abroad.

The commercial value of whales in Japan depends to a large extent upon the time of the year when they are taken. If it is cold enough to allow the meat to reach the nearest large city without decomposition, and the supply of fish in the markets is limited, a blue whale may bring 8,000 yen ($4,000); under conditions less favorable, perhaps only 6,000 or 7,000 yen. By actual weight it was ascertained that a blue whale (the largest species), 76 ft. long, yielded over 40 tons of red meat alone; the blubber, viscera, bones, and other parts, making up the total weight of 63 tons.

The humpback whale, which reaches a maximum length of 55 ft., although considerably smaller than the finback or blue whales, in Japan is the most highly prized because of its delicate flavor, the flesh sometimes bringing as much as 30 sen (15 cents) per pound; but such a price is unusual and ordinarily it can be purchased for 16 sen or less.

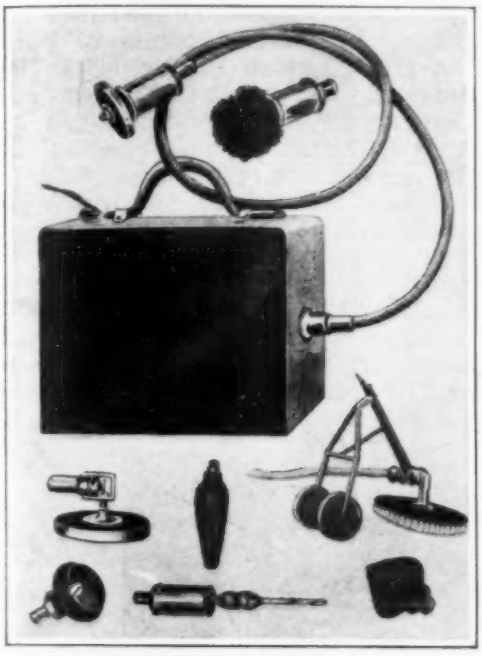
In America and other countries the commercial value of whales depends entirely upon how thoroughly the by-products are utilized. If only the oil is taken, a blue whale may be worth little over $200, but if the entire carcass is worked up, it may bring $1,000 or $1,500, according to the price of oil and guano.



"Cutting In" a Finback Whale: Stripping the Last of the Flesh from the Gigantic Bones

PORTABLE POWER PLANT OPERATES MANY TOOLS

A general-utility machine for office buildings, apartment houses and small shops is now on the market, which is



Attached to Any Light Socket, This Machine will Operate 77 Tools, One at a Time

so adaptable that its uses are manifold. Seventy-seven tools, so the manufacturers say, may be operated by this one handy contrivance. A friction-drive handle with flexible shaft attached to a ¼ or ½-hp. motor, gives a speed of from 1,650 to 2,700 revolutions per minute. Among the many uses may be mentioned riveter, casting chipper, chisel hammer, brick drill; one can remove varnish, polish floors, grind down marble and tile floors, make keys, repair safe locks, polish brass, and drill holes in brass, iron, cement, marble, and brick. Garage and automobile owners find this small machine available for polishing automobile bodies and brass fixtures without removing them from the machine. It will scrub floors, clean walls, or hammer 1,700 blows a minute, as may be desired.

MAIL BOXES INDICATE OUR COMMERCIAL ACTIVITY

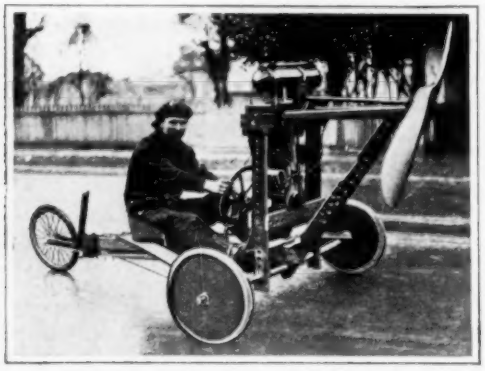
A German statistician has figured out that the number of collection boxes used by the postal authorities of each nation may serve as an indication of commercial activity. According to his information the nations rank commercially as follows: Germany, with 155,766 boxes for collection of mail; the United States, with 144,640; France, 79,724; British India, 75,083; United Kingdom, 71,986; Japan, 67,694; Austria-Hungary, 59,503; Italy, 39,767; Russia, 31,714. Other countries range from Switzerland with 13,472, to Persia with 17, and Abyssinia with only 6.

ELECTRIC HAND DRIER SUPPLANTS TOWELS

Drying the hands by means of a current of warm air is a modern sanitary device recently installed in a Washington office building. The electric hand drier is an upright cabinet about 3 ft. high. An opening at the top, over which the hands may be held, gives egress to a current of air blown from within, and controlled by a lever operated by the foot. When the lever is depressed, the electric current is switched on the blower, and the air is forced through a heating coil, which brings it to a proper temperature. Thirty seconds is all the time required for the drying process, and the cost per hundred pairs of hands is just one cent. This contrivance meets sanitary requirements and threatens to supplant, if it does not abolish, both the roller towel and its paper substitute.

AERIAL PROPELLER FOR AUTOMOBILE

A speed of 50 miles an hour has been attained by two Vancouver youths in a novel craft equipped with



Curious Auto Driven by Aerial Propeller

an aerial propeller. The machine has three wheels. Upon the front axle, carrying two wheels, the engine is supported and drives a 6-ft. blade at the rate of 700 revolutions per minute. The rear wheel is set 7 ft. behind the front axle and is used to direct the course, being operated by a steering wheel in the hands of the driver. Only 4½ hp. is developed by the engine, but as the propeller blade has a pitch of 5 ft., sufficient pulling power is produced to give high speed. It is stated that the aerial propeller is much cheaper to operate for the power developed than ordinary automobile gearing. It is proposed to build larger and more powerful tractors using this form of propulsion for commercial purposes.

FIRST BOAT GOES THROUGH CANAL UNDER OWN STEAM

The first vessel to go through the Panama Canal from one end to the other under its own steam was the crane boat "Alexander Lavalley," regularly employed in construction work on the isthmus. Eighty months from the day work was begun under Maj. G. W. Goethals as chief engineer, navigation through the completed canal was an accomplished fact.

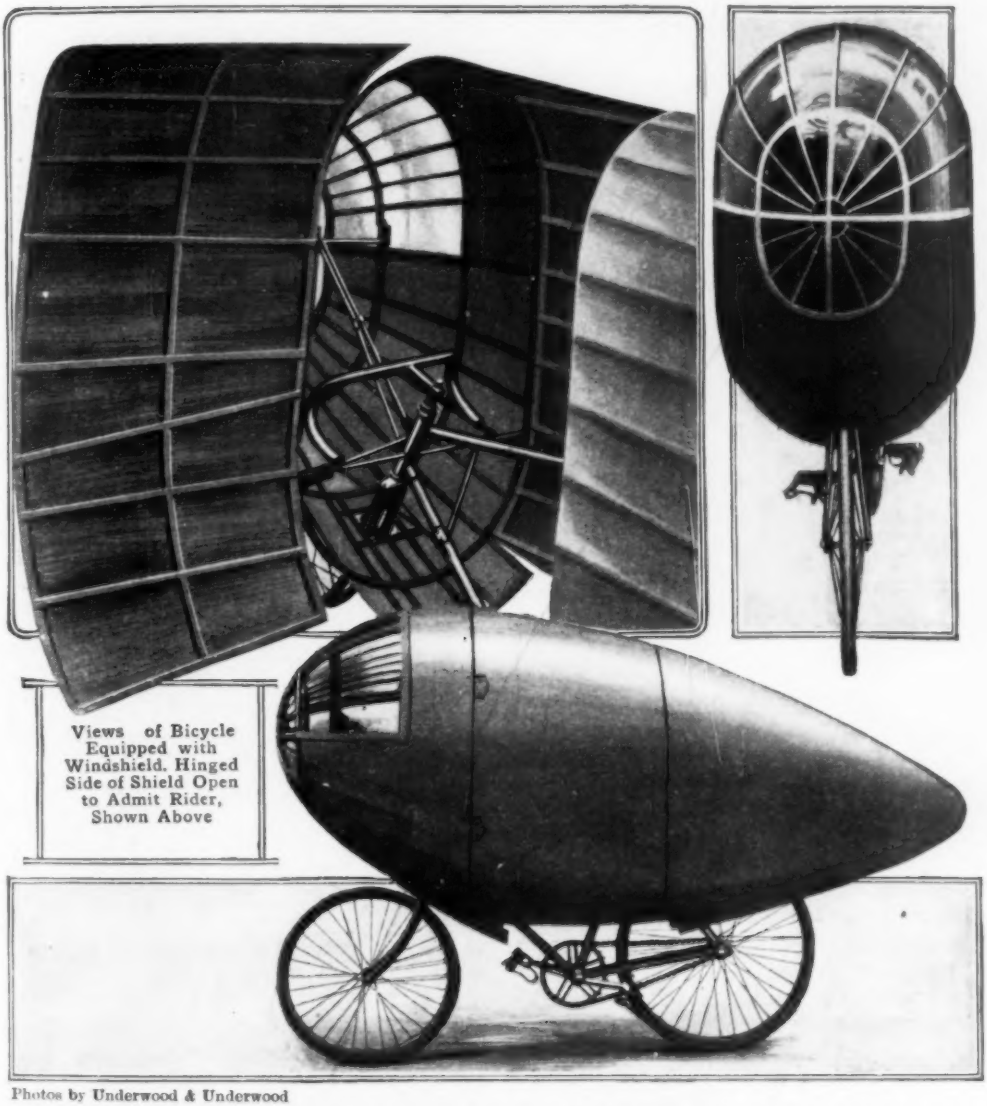
DUTCH BABIES NEED NO CRADLES

The "baby tender" invented and used to this day in the Island of Marken in the Zuyder Zee is the substitute for the cradle which resists the advance of baby carriages and modern high chairs. In Marken, babies of both sexes are dressed exactly alike, the accepted fashion having been unchanged for three centuries. At so early an age is the infant incased in the stays of this costume that there is no use for a cradle for babies in Marken. The child is supported and kept out from under foot in a wooden contrivance serving both as a chair and cradle, which is mounted on small wheels so that it may be readily moved about. A shelf in front serves as a rest, or receptacle for food or playthings.

Copyrighted by Waldon Fawcett
Famous "Baby Tender" of Holland is Substitute for Cradle

¶Two furnaces at Alburtis, Pa., are said to be the only remaining blast furnaces in the country operating exclusively on anthracite coal.

TORPEDOLIKE WINDSHIELD FOR BICYCLE



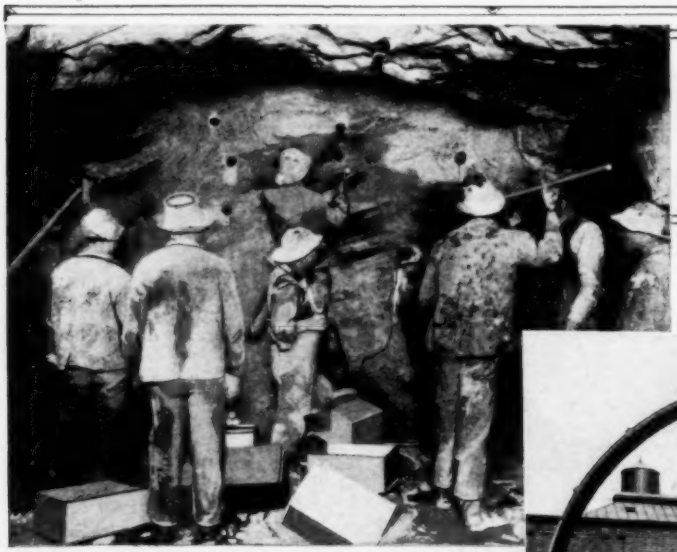
Views of Bicycle Equipped with Windshield. Hinged Side of Shield Open to Admit Rider, Shown Above

Photos by Underwood & Underwood

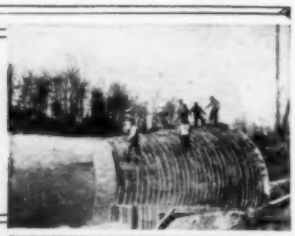
Equipped with This Shield, the Bicycle Covered a Three-Mile Course at the Highest Speed Known to have been Attained by a Foot-Propelled Vehicle

Using a windshield shaped much like a torpedo, a French cyclist covered a course of 5 kilometers, or a trifle over 3 miles, at the Velodrome d'Hiver in Paris, in 5 min. 46⅘ sec. This is said to be the highest rate of speed known to have been attained on a course of this length by a foot-propelled bicycle. The shield consists of a light frame over which canvas is stretched. At the front a portion of the canvas is cut away and mica substituted in order to provide the rider with the necessary view ahead. The front of the shield splits the wind with a minimum of resistance, while the rear tapers off to prevent the formation of eddies or a partial vacuum.

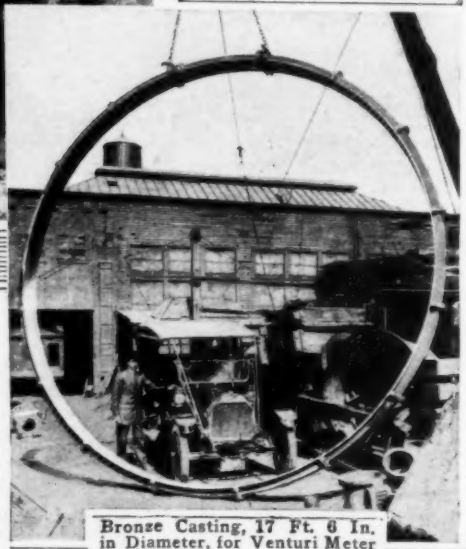
GREAT NEW YORK AQUEDUCT NEARLY COMPLETED



Placing Dynamite for the Last Blast in the New York Aqueduct Tunnel



Building One of the Great Venturi Meters Which will Record the Flow of Water



Bronze Casting, 17 Ft. 6 In. in Diameter, for Venturi Meter

Photos by Underwood & Underwood

The hundred-mile tunnel through the rocks, which is to bring pure water from the Ashokan reservoir to New York City, has been so far completed that the building of the great Venturi meters has begun. Late in the eighteenth century an Italian philosopher, J. B. Venturi, observed that fluids discharging through an expanding nozzle exert a sucking action at the smaller diameter, which diminishes as the diameter enlarges toward the outlet. A hundred years later this principle was applied in the construction of meters for measuring the flow of great volumes of water through tunnels and aqueducts. Three such meters are being installed in the New York project, which will measure the flow of water through the tunnel without in the least interrupting or restricting the amount delivered. Tubes extending from both the normal and the expanded diameters of the aqueduct indicate different pressures, affording a basis for calculating the flow. No flow of water takes place through these tubes, as they simply transmit the two pressures, the difference in which controls the reading of the instrument.

SMALL FIRE CRIPPLES CITY'S TELEPHONE SERVICE

When some of the telephone wires of the Montreal public-telephone service came in contact with a power or high-voltage circuit a slight blaze broke out in the "main" exchange, which was extinguished in five minutes, but the damage done was so great that telephone service was interrupted for more than a week, although 40 expert repairmen were employed in relays in the reconstruction work. The wires forming the switchboard connections for 12,000 lines were destroyed, the paraffin covering over the insulation being very inflammable, so that

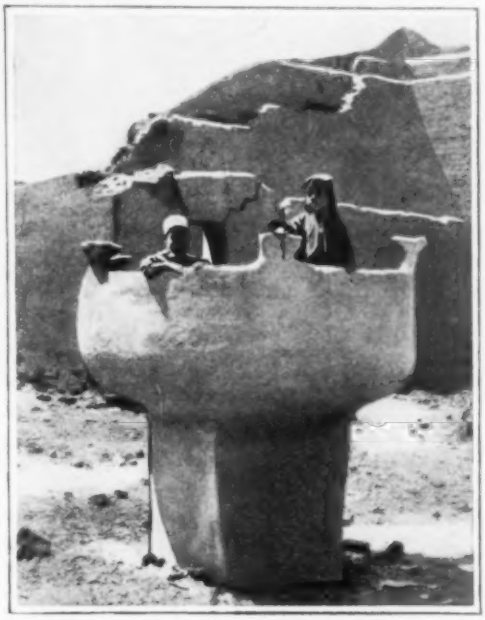
the flames spread quickly until extinguished. The tie-up affected the entire down-town district, and patrons were obliged to resort to messenger and special-delivery service for communication.

THE WRECK OF THE "COBEQUID"

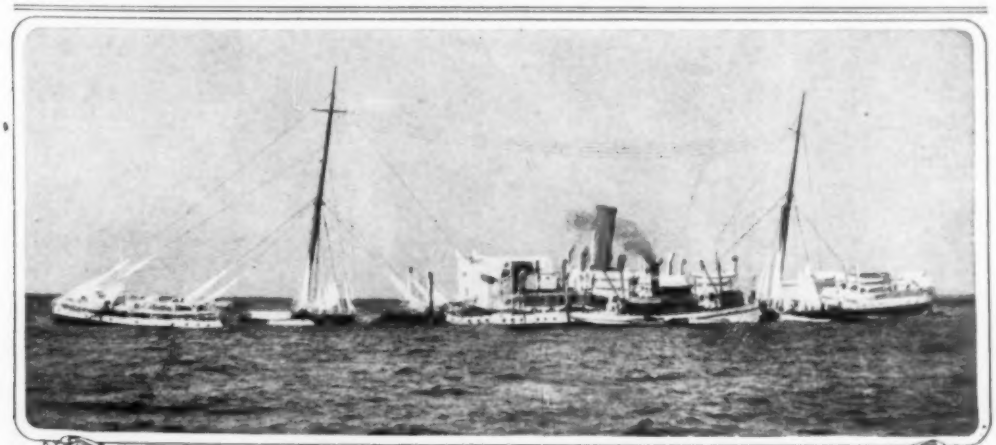
The royal-mail packet "Cobequid" was wrecked on Trinity Rock in the Bay of Fundy last January, and 108 persons rescued after suffering intensely from cold and exposure. A wireless call for help was sent out as soon as the ship struck, but the operator could not give the ship's location, for no one on board knew it exactly, and a heavy fog rendered it impossible either for the wrecked to make out their position or the rescuing vessels to find the wreck. The ship broke in two, the water poured into the engine room, extinguishing the fires and interrupted wireless apparatus. Thirty-six hours later, however, through the lifting of the fog, a fisherman made out the wreck on Trinity Ledge, and gave information which brought the coastal steamers "Westport" and "John L. Cann," which rescued the passengers and crew. The vessel was covered with ice and almost submerged when the rescuers arrived.

PRIMITIVE SLEEPING PORCH USED BY ARABS

This curious structure made of mud and open to the sky is used as a sleeping chamber at night in Arab villages, during the great heat of the summer. Detached from the house; it affords protection against the snakes, scorpions and lizards abounding in the summer.



Arab Outdoor-Sleeping Device Which Gives Protection from Nocturnal Pests



Coasting Steamers Taking Off Passengers and Mail from the Wrecked "Cobequid"

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SCANDINAVIAN PASTIME ENJOYED IN AMERICA

Photo Int'l News

Jumping with Skis at St. Moritz, Switzerland

Watching the Jump-Off at Prospect Park, Brooklyn

Measuring the Length of a Ski Jump at Duluth

The Ski Slide at Duluth, on Top of the City's Highest Hill

SKI JUMPING IS INCREASING IN POPULARITY

Photo Int'l News Service
Exhilarating Sport on a Swiss Lake; Here the Skis are Used as Sleigh Runners, and Galloping Horses Furnish the Motive Power

Photo Underwood & Underwood
In Montreal Ski Jumping is an Institution

This Popular Sport Always Draws a Big Crowd to Prospect Park, Brooklyn

Canadian Girls Find Skiing Fascinating Exercise

TRAIN CAUGHT WHEN TUNNEL CAVED IN

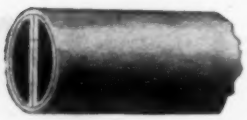
An Earthquake Wrecked a Tunnel on a German Railway Line, Trapping a Train and Killing Several Passengers

Photo by Underwood & Underwood

A slight earthquake in Saxony was responsible for a cave-in as a passenger train was passing through the railroad tunnel through the Harras cliffs, near Chemnitz. The locomotive had just emerged when the falling rocks caught it, crushing several coaches and causing several fatalities. A high wind and a blinding snowstorm hampered the rescue work, so that it took several days of hard work to clear away the debris.

REINFORCED TUBING WHICH HAS WALL IN CENTER

A seamless steel tubing, having a central pillar or support, has been invented to withstand the extreme stresses developed in automobile operation. This tubing may be bent to any desired shape, and stands up under bending and flattening strains. It is being used in the manufacture of cyclecars, automobiles, motorcycles and aeroplanes, as well as in such vehicles as gocarts, bicycles and small wagons.



LINING A DEEP MINE WITH CONCRETE

More than a third of a mile beneath the surface of the earth, the junction shaft of an Arizona mine became a manhole for the water from all the other mines of the district. Immense steam pumps were required to lift this drainage water to the surface, where it was utilized for irrigation. Engineers suggested that lining the mine with concrete would stop the influx of water and avoid the heavy expense

of pumping. A strong concrete mixture was made at the surface, piped down to lower levels into molds and allowed to harden in place, where it does away with the necessity for wooden supports, lessening fire risk, reducing cost as well as shutting out water flow entirely. Very little reinforcement was used, and notwithstanding frequent predictions of failure, the concrete, which is completed for 1,500 ft. from the bottom, is proving a successful solution of many problems.

PASSING DREDGE THROUGH PANAMA BRIDGE

To permit the passage of a dredge up the Chagres River arm of Gatun Lake, a girder span of the Panama Railroad was moved out of the way on barges and then replaced after the dredge had passed, the work being done so quickly that train service was not interfered with in any way. The two barges were securely fastened together, and a strong timber scaffold for supporting the span was built across them. When all was ready, the span was lifted by two powerful locomotive cranes, one at each end, the barges were floated under, the span was lowered upon the scaffold and the barges were towed out of the way. The dredge is to be used in excavating gravel from extensive gravel beds in the old Chagres River.

BIG STEEL SMOKESTACK BREAKS IN TWO

During a cold spell last winter a new steel smokestack in North Adams, Mass., gave way under the stress of high winds, and broke just above the ring to which the guy wires were attached. Toppling over to one side, four sections hung until a scaffolding was built up to enable the workmen to remove the wreckage.

¶In the Philippines a launch is used by the forestry bureau for service between the islands, while in Alaska and Florida the forest service employs a number of launches for transportation in salt water as well as on inland lakes.

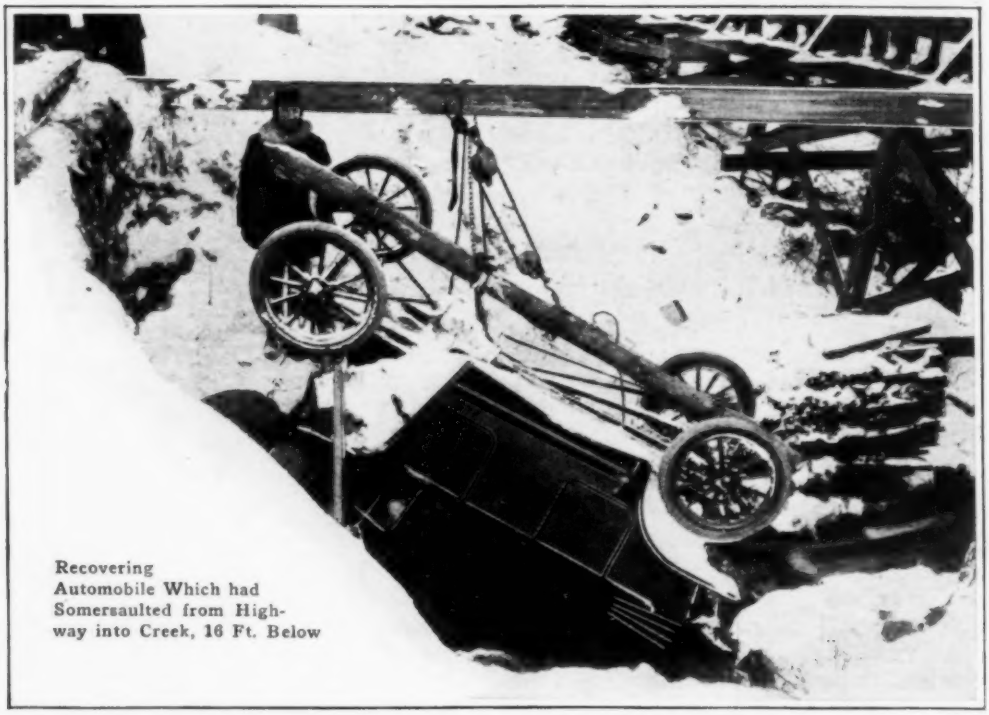
Dredge Passing through Opening in Bridge

Copyrighted by Underwood & Underwood

Moving a Steel Span of a Panama Railroad Bridge to Permit the Passage of a Dredge into the Chagres River

CAR SOMERSAULTS DOWN EMBANKMENT

An automobile went down a steep embankment, 16 ft. high, into a creek at Marion Hills, Minn., on New Year's day, turning two somersaults before it came to a stop, bottom side up. While the car body was considerably damaged, the engine was in such good condition after the accident that the car was able to proceed under its own power after being replaced on the highway.



Recovering Automobile Which had Somersaulted from Highway into Creek, 16 Ft. Below

CONCRETE MIXER TIES UP STREET-CAR LINE

When a concrete mixer was driven beneath a low railway viaduct, the top of the vehicle came in contact with the lowered trolley wire of the car line which passed under the bridge, thus forming an electrical connection between the wire and the rails below. Portions of the mixer were melted by the high-voltage current, the iron wheels being welded to the tracks. Fortunately the driver was walking beside his horses when the accident happened and escaped electrocution, as did the horses, which were quickly unhitched. Street-car traffic was delayed for several hours until the mixer was chiseled loose.

WRIGHT GIVEN PRIZE FOR AEROPLANE STABILIZER

The Collier Prize of the Aero Club of America for the most valuable advance in the science of aviation in 1913 has been awarded to Orville Wright for his automatic stabilizing device. This apparatus is described by Mr. Wright as follows:

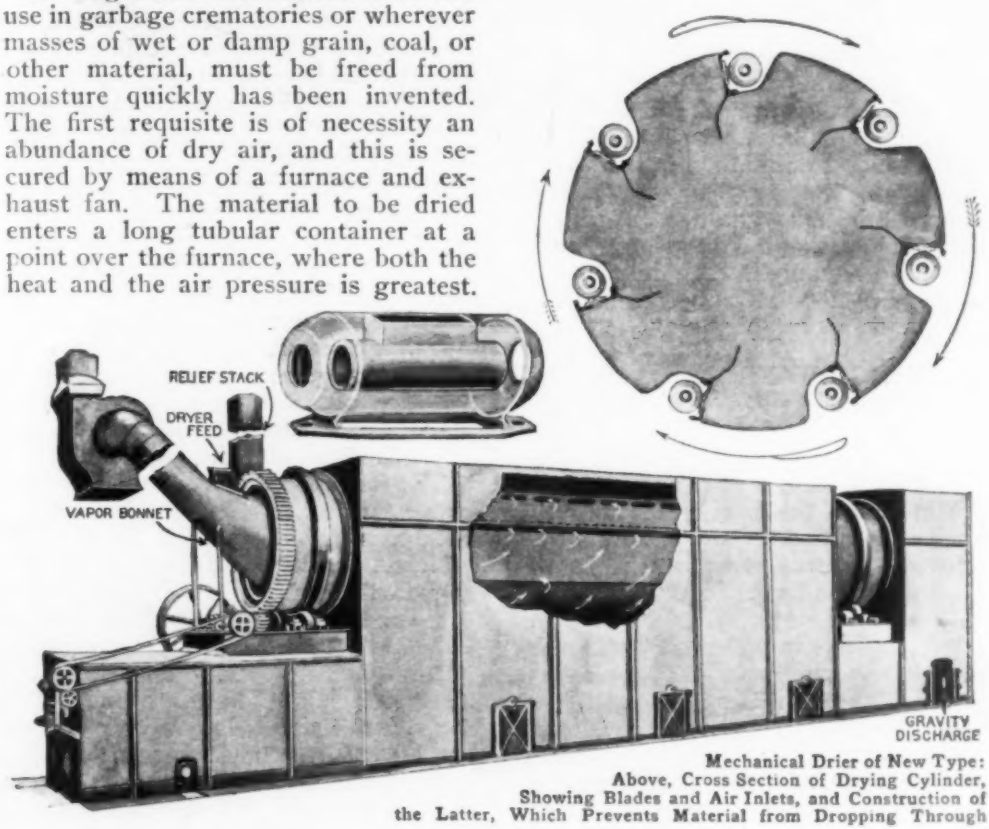
"The stabilizer consists of two parts —one controlled by a pendulum for maintaining the lateral balance; the other controlled by a vane for fore-and-aft balance. The power for warping the wings and turning the elevator is furnished by a small windmill attached to the aeroplane, so that the stopping of the motor does not affect the operation of the device."

With the experimental applications of this principle that have been tested in practice, several remarkable flights have been made by Mr. Wright and others, with and without passengers, with the hands of the pilot off the control and steering mechanism for minutes at a time.

Power for the wing warping and elevator control is transmitted by means of compressed air from a compressor which is operated by the windmill, the deflection of the pendulum or the vane opening air valves, which are closed as the machine resumes a normal position. No definite design of this apparatus has been finally decided upon and the experiments will be continued until a satisfactory form has been found.

MECHANICAL DRIER WHICH OPERATES RAPIDLY

An ingenious mechanical drier for use in garbage crematories or wherever masses of wet or damp grain, coal, or other material, must be freed from moisture quickly has been invented. The first requisite is of necessity an abundance of dry air, and this is secured by means of a furnace and exhaust fan. The material to be dried enters a long tubular container at a point over the furnace, where both the heat and the air pressure is greatest. As the container revolves, the material drops from sheet-metal blades by gravity, while warm, dry air continually flows through it. As the container is inclined, the gradually drying mass is thrown farther and farther back, until, when entirely dry, it is discharged at the lower end. Along the sides of the cylinder are numerous openings through which the heated air from the furnace, but not the products of combustion, are admitted. It will be seen from the illustrations that no matter how finely the material may be pulverized, none of it can drop through the air openings, owing to the peculiar form of the registers, which are cylindrical with the inner openings protected by smaller pipes. This mechanical drier can also be used without furnace heat and will even then evaporate a great deal of water, through the continual cascading of material and the influx of air.



Mechanical Drier of New Type: Above, Cross Section of Drying Cylinder, Showing Blades and Air Inlets, and Construction of the Latter, Which Prevents Material from Dropping Through

MOTORCYCLE MADE INTO ICE BOAT

By removing the rubber tires and placing iron bands studded with sharp

Motorcycle Capable of Making 75 Miles an Hour over Smooth Ice

horseshoe calks around the wheel rims a Minnesota motorcyclist has converted his machine into a practical and speedy ice motorcycle. The calks are placed 3 in. apart, and so effective are they in securing a firm grip on the ice, that the machine is capable of making a speed of about 75 miles an hour.

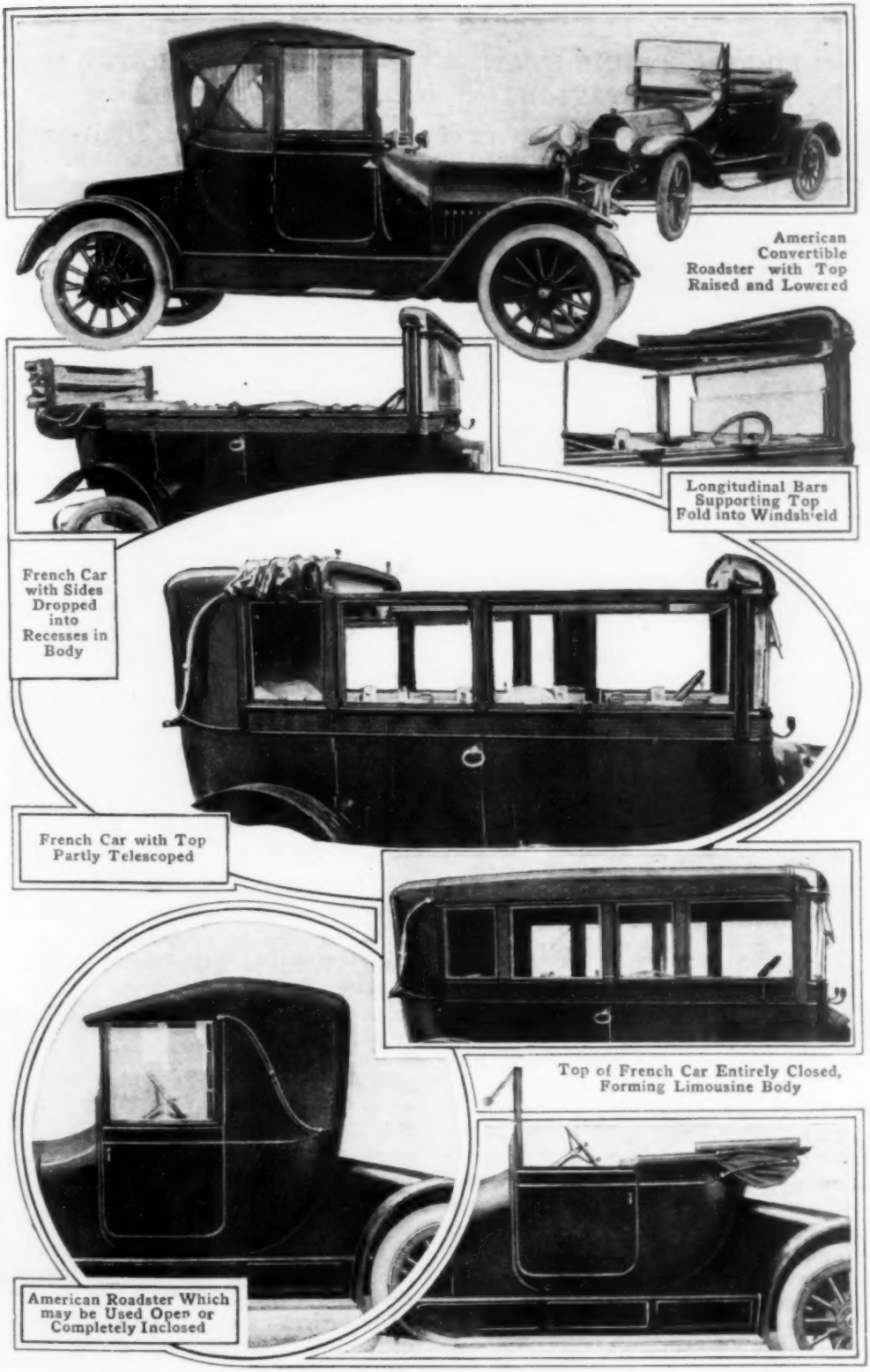
MOVING-PICTURE OPERATOR BLINDED

Intense actinic rays are given out by the electric arc, which have injurious effect upon the eye if permitted to strike the retina for any length of time. Moving-picture operators who have to deal with this form of illumination usually protect their eyes by wearing glasses of heavy orange-brown shade, which absorb these dangerous rays. One instance is related, however, of an operator in Spokane who endeavored to repair some mechanism connected with his machine without turning off the light and without wearing his protecting glasses. Although he was engaged in this occupation but a few minutes, and felt no immediate pain, three hours later he was entirely blind, and but for prompt treatment would doubtless have been permanently injured. Fortunately the affection was only temporary.

CONVERTIBLE TOP LATEST MOTOR IMPROVEMENT

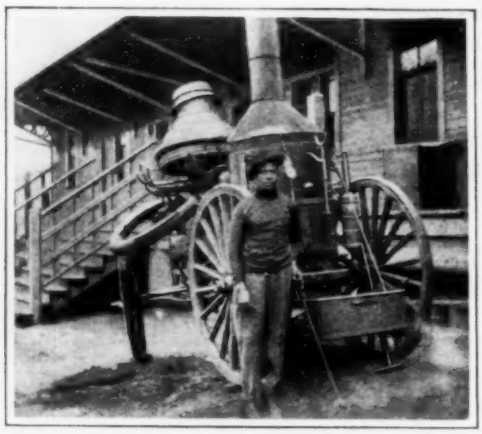
Among the improvements shown at the recent automobile shows the convertible top will probably strike the man who can keep but one car as being among the most important. At least three roadsters having tops by which the car can be quickly made into an open or closed car are now being manufactured in this country, but it remained for the French to develop a top of this kind that is applicable to the largest touring cars. Just what this will mean in the way of comfort and economy is apparent in view of the almost universal practice of winter driving, and the extreme changes in weather that are characteristic of winters in this country. Owing to a cold snap at the beginning of the past winter many touring cars were changed from open to closed tops. During a succeeding spell of warm weather the closed tops were a positive discomfort, but in most cases another change could not well be made owing to the expense, such a change requiring either the substitution of one body for the other or elaborate changes in the top that amounted to about the same thing.

The new French tops for touring cars work much after the manner of the convertible roadster tops with which American motorists are becoming familiar. The roof is made to telescope, and folds down with the back upon the rear of the body in the same way as a buggy top, while the sides are made to drop into recesses in the sides of the body. With either of these tops, which differ in minor details, a change to an open or closed car can be made in a few minutes.


American Convertible Roadster with Top Raised and Lowered
Longitudinal Bars Supporting Top Fold into Windshield
French Car with Sides Dropped into Recesses in Body
French Car with Top Partly Telescoped
Top of French Car Entirely Closed, Forming Limousine Body
American Roadster Which may be Used Open or Completely Inclosed

OLD FIRE ENGINE HEATS RAILWAY STATION

When the regular heating plant of a Mississippi railway station was put out of commission by reason of dam-



Fire Engine Used as Temporary Heating Plant

age to the boiler, an old fire engine was coupled to the heating coils of the station, and a comfortable temperature maintained without difficulty. Pipes were run from the boiler of the fire engine to the mains in the basement of the station and steam was sent to all radiators until the regular boiler was in commission again.

REMARKABLE TUNNEL UNDER THE MISSISSIPPI

The city of St. Louis is safeguarding its water supply by a tunnel blasted out of solid limestone, 64 ft. beneath the Mississippi River. When this new intake tunnel is completed it will be 2,766 ft. long, 516 ft. extending beneath the land and 2,250 ft. under the river. The tunnel is tubular, 8 ft. in diameter, and will be lined with concrete when finished. Three shifts work consecutively, and dynamite is exploded three times a day. A new intake tower with a modern arrangement for the inflow of water, is provided, and the menace from slush ice will be reduced to a minimum.

DIRIGIBLE OPERATED BY WIRELESS

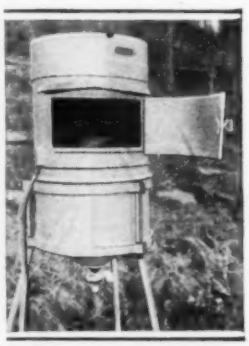
A new type of dirigible controlled and propelled by wireless waves has been tested out at Genoa, Italy. By transforming the intermittent impulses of the wireless into a continuous current, the inventor has been able to operate the various propellers at will. The transforming device is contained within the basket, or car, of the dirigible, and also operates the bomb-dropping device by which the dirigible is designed to aid the army and navy in case of war.

NOVEL RUBBER GRIP FOR GOLF CLUBS

Greater control of the grip on the golf club is secured by a device recently seen in England, which consists of a rubber attachment that slips over the handle, molded with grooves for the fingers of the left hand. For the little finger a slightly overhanging support is provided on which the club may be suspended while in use. The grooves being separated, the fingers assume a correct position on the club, permitting an easy and efficient grip.

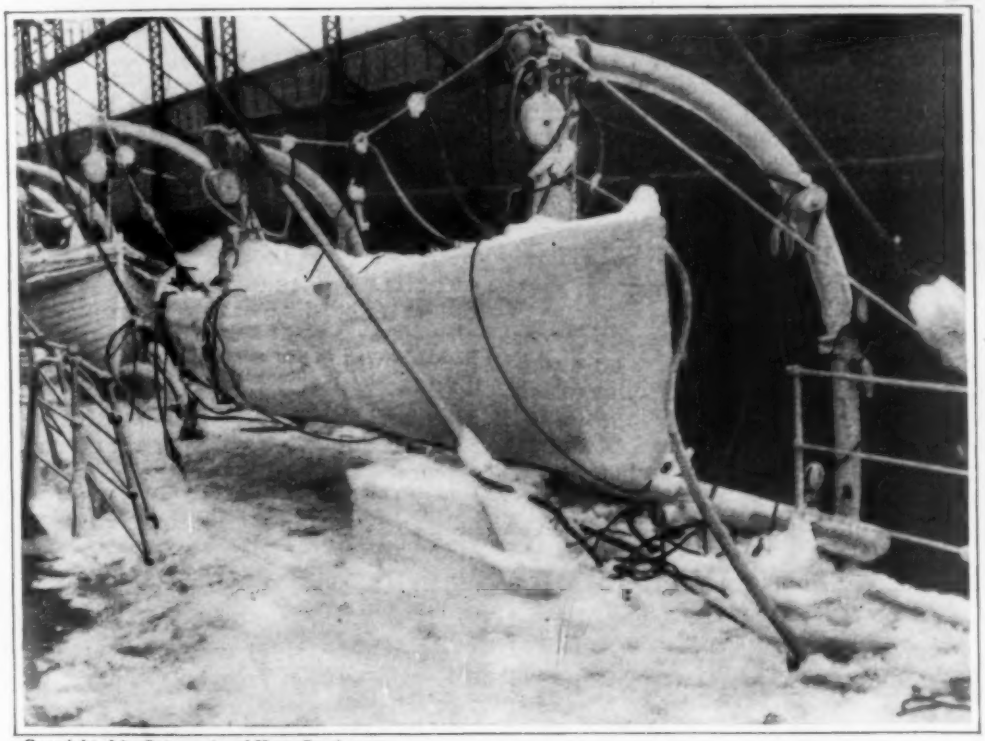
RAIN GAUGE THAT EMPTIES ITSELF AUTOMATICALLY

At Wagon Wheel Gap, in the heart of the Rocky Mountains, the United States Weather Bureau and Forestry Service maintains a meteorological station where rainfall is automatically recorded by a tipping bucket gauge. When the small cup or bucket in the inclosure is filled with water it automatically tips and makes an electrical record at headquarters, half a mile away.



OCEAN LINER COATED WITH FROZEN SPRAY

When the "Oceanic" arrived in New York recently after a cold snap, her upper works were completely incased in ice. The spray from heavy seas which constantly broke over her froze before there was time for it to evaporate, so that on the ship's arrival at New York, she suggested a polar-exploration vessel.



Copyrighted by International News Service
The Upper Works of the "Oceanic" Completely Coated with Frozen Spray

INGENIOUS METHODS USED IN SALTING MINES

Years ago it was no uncommon practice for unscrupulous speculators to offer for sale gold or silver mines of little or no value, but showing upon tests an ore assaying high, and often remarkable, values. This was accomplished by distributing ore taken from high-grade mines in the workings of the poor mine, the process being known as "salting." Such crude methods were easily discovered, however, and shrewd schemers have found less obvious means of defrauding prospective purchasers.

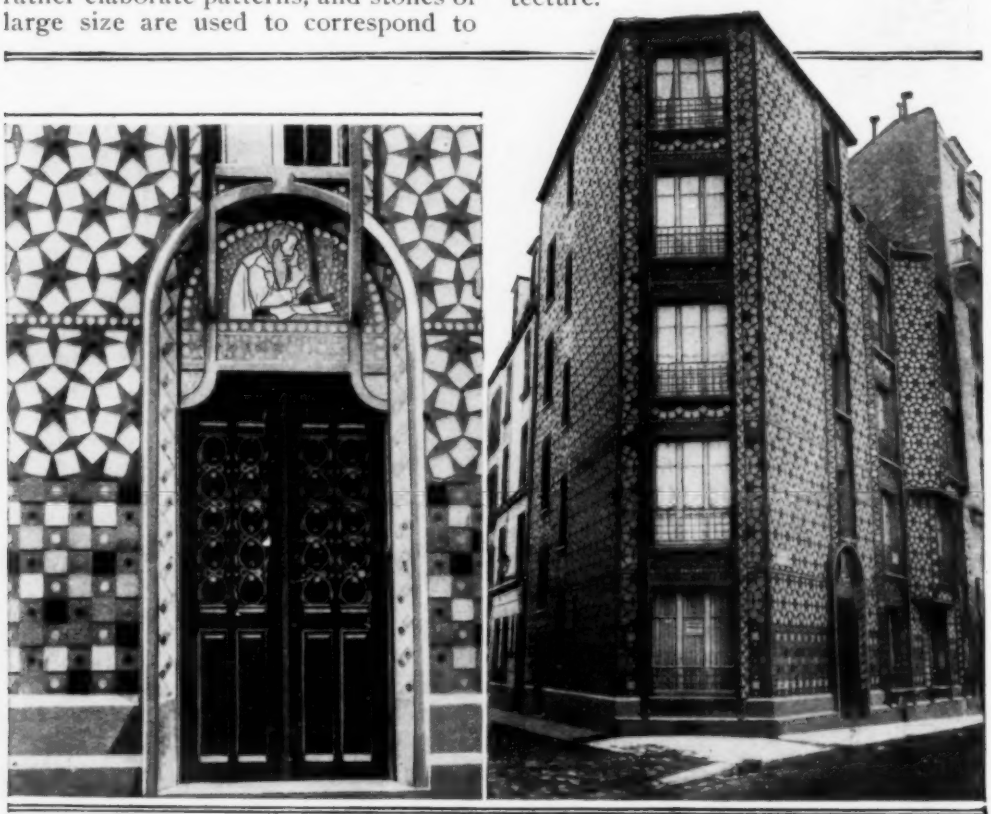
In one instance a low-grade mine in Alaska was sold to eastern buyers through an ingenious "salting" which defied precautions. The prospective buyers sent two different corps of engineers to Alaska to investigate the mine, but the miners were able to "salt" the samples so that the values appeared large. A third engineer was at length sent, who insisted that he be permitted to visit the mine alone and obtain samples in his own way. He took several tons of ore with him in large sacks, which remained on the wharf for several days awaiting the arrival of the ship which was to take it to San Francisco, in charge of watchmen night and day. Two men dressed as tourists strolled about the wharf, also evidently awaiting the arrival of

the vessel, and engaged the watchmen in conversation, asking all manner of foolish questions, and all the while punching the bags with their canes. This was repeated day after day, sometimes in one disguise and sometimes in another.

The ore finally reached San Francisco, and assayed so well that the deal was completed and the first payment on the mine, amounting to over $100,000 was made, before the fraud was discovered. The canes which the tourists carried were filled with chloride of gold, and at each punch several ounces were injected into the ore. This gold was revealed in the assay, and the value of the ore was apparently great. Other methods, no less cunning, have been exposed, such as shooting chloride of gold from a shot gun into the breast of the drifts and the bottom of the shaft. Fortunately the practice of salting is now uncommon, although instances are occasionally brought to light.

PARIS RESIDENCE WITH MOSAIC WALLS

One of the most curious residences in the world is that built by an architect of Paris for his own use, in which the exterior walls are composed of mosaic. The mosaic is worked out in rather elaborate patterns, and stones of large size are used to correspond to the scale of the patterns. This treatment is used consistently throughout the exterior, borders of mosaic being placed as vertical and horizontal panels around the windows and doorways, while over the main entrance is a picture composed of fragments of stone representing the profession of architecture.

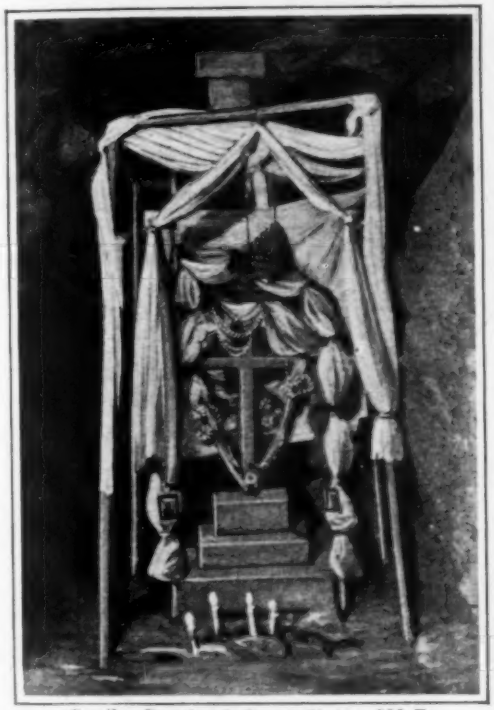


Photos by Underwood & Underwood

Residence in Paris, France, Composed Entirely of Mosaic, and, at Left, Main Entrance, with Mosaic Figure Representing Profession of Architecture

PIOUS MINERS WORSHIP AT DEPTH OF 500 FEET

Five hundred feet below the surface of a silver mine in Mexico one may



Candles Burning before a Shrine, 500 Ft. Underground

see a cross, surrounded with offerings, before which burn constantly many candles. The more ignorant of the native miners believe that if they place candles before the shrine no evil can befall them, and that accidents likely to happen in mines are warded off.

AIRMAN SEEKS TO FLY AROUND THE WORLD

The French airman, Vedrines, who has made a successful flight from Paris to Cairo, now plans to continue on around the globe. He will fly from Cairo to India, Indo-China, and the East Indies to Australia, if possible, but beyond Australia he does not profess at this time to determine his further path. A glance at a map will indicate his difficulty in arranging a practicable route from Australia.

LOADING MAHOGANY LOGS ON A STEAMER

The interior of Nicaragua contains forests of mahogany, some of the finest grades of that splendid wood being shipped from that country. Felled in the dense tropical forests, roughly hewn and hauled to the seaboard, these huge logs are thrown in the water, chained in large booms to await the passage of an up-bound steamer. To see them hauled up, glistening in the sunlight, their grain showing up in a brilliant red, is one of the interesting sights for the tourist. Some of the logs weigh as much as two tons, and are valued at a hundred dollars each.

Logs of Mahogany being Hoisted on Shipboard at a Nicaragua Port

White mahogany is also shipped from Nicaragua, and is increasing in popular favor.

"MONA LISA" IDENTIFIED BY PAINT CRACKS

How Lost "Mona Lisa" was Identified by Paint Cracks. Photograph, Made before Painting was Stolen, at Left. Photograph, Made after Painting was Found, at Right

Courtesy Illustrated London News

Thumb Print Found in Police Records and Thumb Print Found on Frame of Painting

The first question asked by the average person after the announcement of the finding of the lost "Mona Lisa" was "How do the experts know with any certainty that this is the same painting that was stolen from the Louvre?" A big business is carried on in faked works of art, and there are many accomplished artists in the world who can imitate an "old master" so skillfully as to deceive even an expert. But the cleverest imitation falls short in just one particular. A network of fine paint cracks is sure to exist in any painting of considerable age, and no way has ever been found for copying these with minute exactness. Through the paint cracks in the "Mona Lisa" it was easy to identify the famous painting positively. This was done by comparing, inch by inch, a photograph taken after the painting was found in Italy with a photograph made before the painting was stolen.

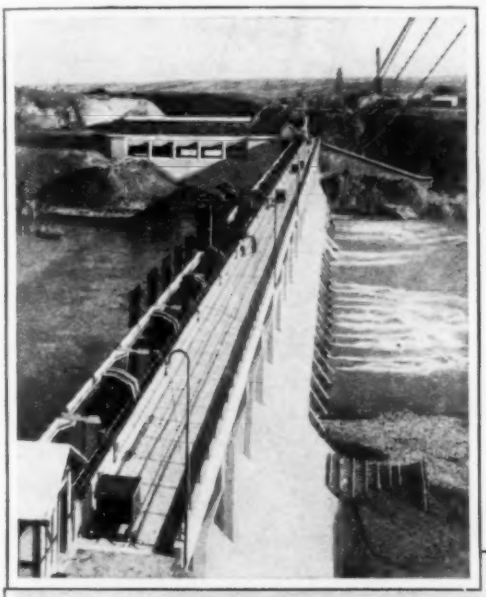
A curious feature in connection with the theft is the fact that the identity of the man who carried off the painting might have been established immediately if the Bertillon records of the Paris police had been classified differently. On the frame, which was left under a stairway of the Louvre, were found five finger prints. Only one of these, a print of the left thumb, was sufficiently distinct to serve for identification. While an impression of both thumbs is always taken, criminal records are classified by the Paris police by means of the right thumb. With 750,000 such records on file it was impossible to find the criminal with only a left-thumb impression. Since his arrest it is found that he is a well-known criminal and that his record is on file with the Paris police.

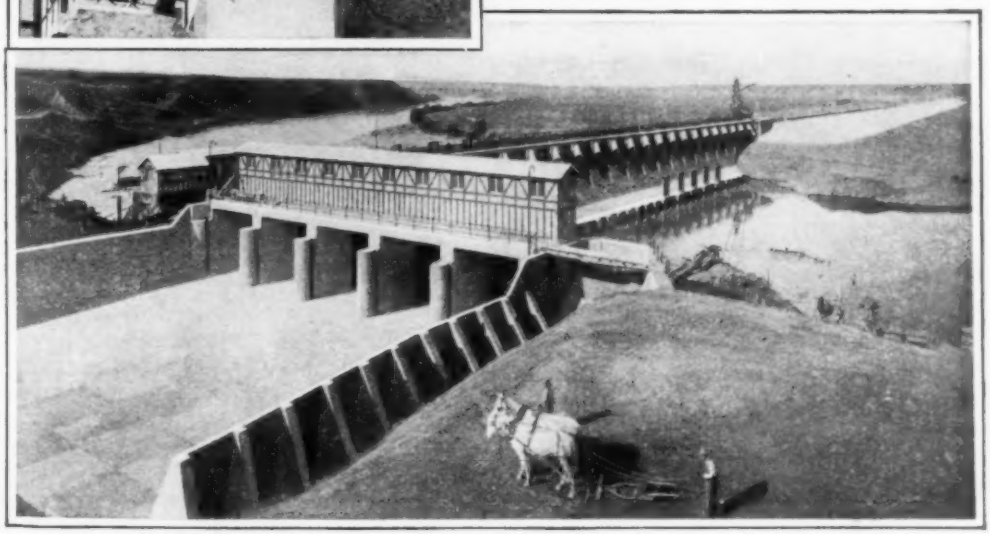
FOIL BURGLARS BY SAFETY CHAINS FOR DOORS

A door fastened with the ordinary door chain, which is often relied on as an additional protection against thieves, is easily picked by the skillful use of a big gimlet and a piece of stout wire. A hole is bored through the door immediately above the chain, the wire, properly bent, is inserted and the button at the end of the chain is moved in the slot by twisting the wire like a key. If the slotted casting is put on obliquely, at an angle of about 45°, so that the chain must be not only slid back but raised in order to get it out of the slot, it cannot so readily be tampered with.

CANADA TO IRRIGATE VAST STERILE TRACT

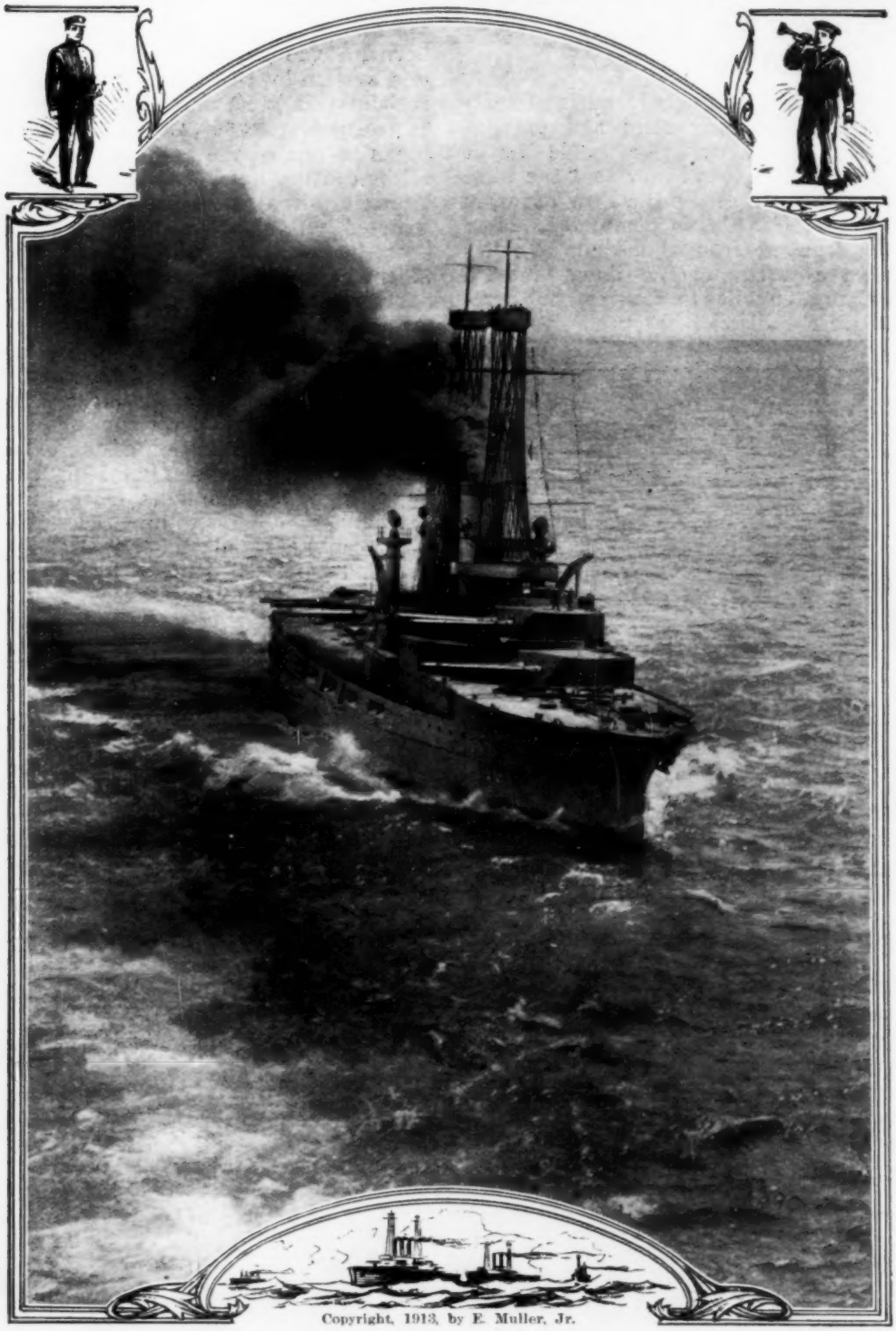
Two thousand square miles of scaly earth, of shifting sand and parched prairie grass will be made fertile through irrigation, now that the huge Bassano dam across the Bow River, in Alberta, Canada, is completed. Here the drainage from thousands of miles to the north comes down toward Calgary, 80 miles to the west, but heretofore the district has been little better than a desert. Three years have been spent in construction of an irrigation system by which it is proposed to reclaim this great territory, and at a cost of nearly $4,000,000 a dam which ranks as one of the engineering feats of the century has been completed. A large irrigation reservoir has been constructed within the irrigable tract and near the farms. A concrete spillway, 720 ft. in length, has a heavy concrete floor protected by cut-off walls. Upon this, buttresses are erected, with a sloping deck, designed to pass 100,000 cu. ft. of water per second, with extreme height of 13 ft. above the crest. An earthen dike at the western end protects the concrete portion of the dam. This dike is a mile and a half long, and 45 ft. high, and contains more than a million cubic yards of material. The main canal extends in an easterly direction from the dam for five miles, when it divides, the smaller portion turning to the north, while the larger continues to the east. One million acres of parched desert will be made to bear abundant crops, repaying a thousandfold the immense sums expended upon the project. There still remain to be placed gates and locks for the irrigating ditches before the district is ready for settlers.





Bassano Dam and Beginning of Main Canal, Upper View Showing Spillway and Protecting Dike

BATTLESHIP "DELAWARE" CLEARED FOR ACTION



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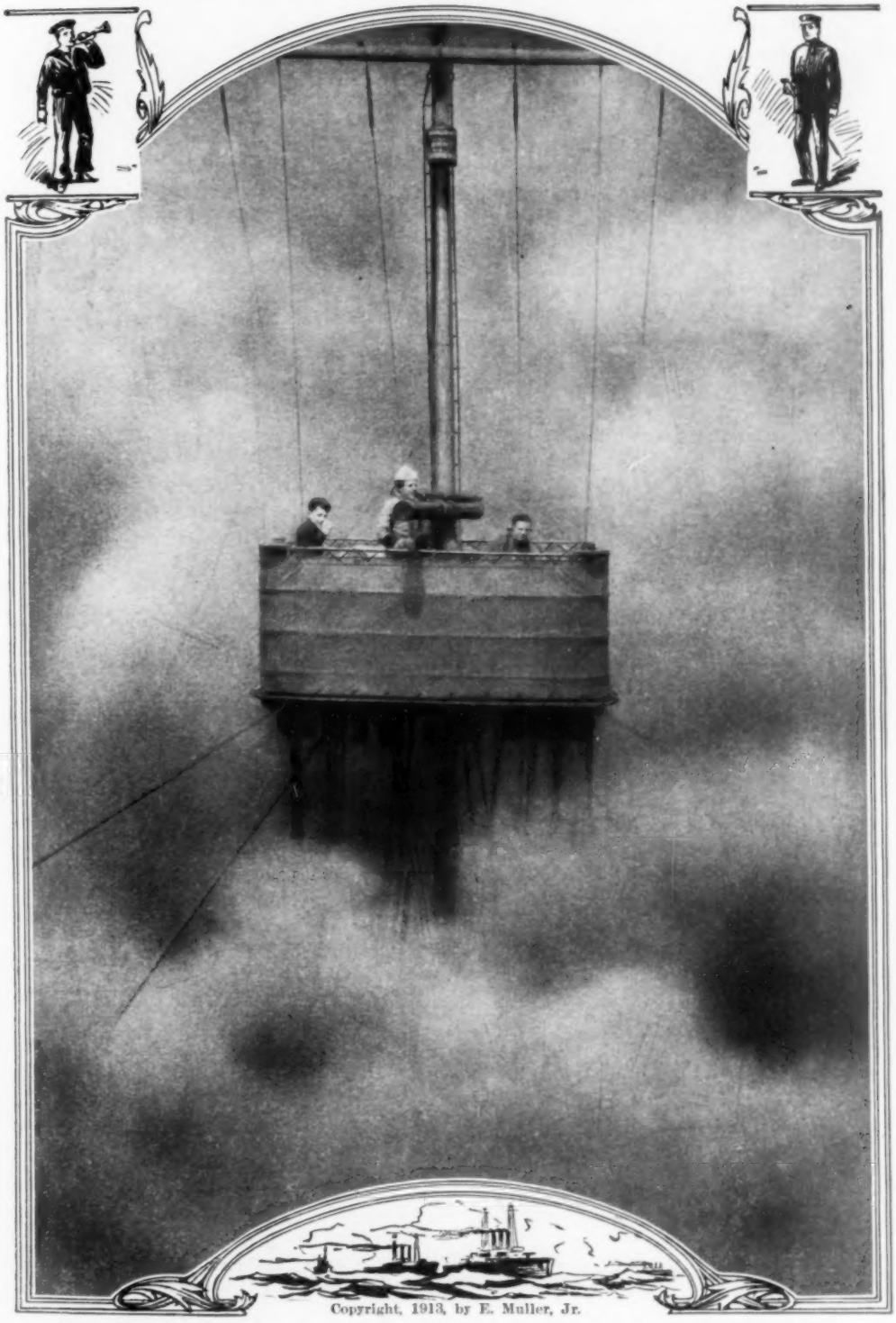
Few Landsmen Ever See a Warship Stripped Down to Fighting Trim. At the Signal "Clear Ship for Action," Every Movable Object on the Decks is Removed and Stowed Below

FINDING THE ENEMY'S RANGE IN BATTLE



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On the Fire-Control Platform of the Dreadnought "North Dakota" during Target Practice. The Gases from the Guns Envelop the Men Who are Trying to Determine the Distance of the Target

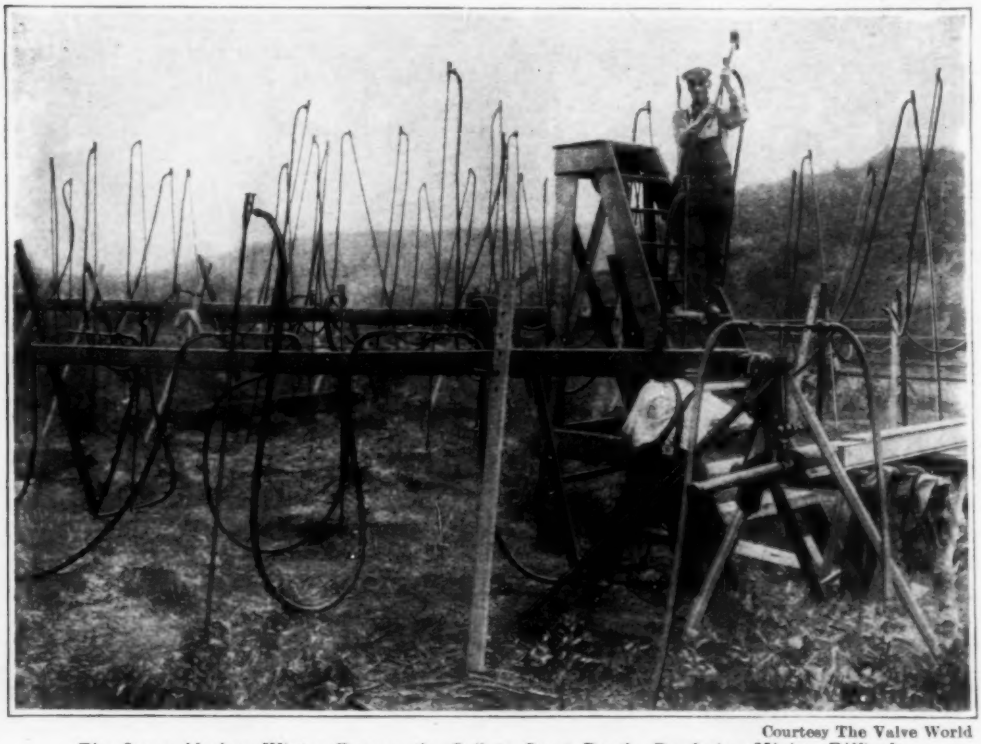
AEROPLANE MAY ATTEMPT ATLANTIC FLIGHT

One of the biggest and most powerful aeroplanes in the world, which, it is believed, may attempt the flight across the Atlantic is now being built at Kingston, England. This enormous craft is provided with seaworthy floats and is a biplane with wings of 81-ft. span, or more than double that of the ordinary aeroplane. It is driven by two 6-cyl. engines, each of 120 hp., giving a power plant with a total capacity of 240 hp. These engines are chain-connected to a single propeller shaft which carries a four-bladed propeller having a diameter of 12 ft. 6 in. and a pitch of 14 ft. In front of the engine and placed side by side are two seats, one for the pilot and one for the wireless operator. Power for the wireless plant is supplied independently of the main engines by a motorcycle engine fixed to the aeroplane within convenient reach of the operator. In addition to the seats for the pilot and wireless operator, there is a larger seat for a gunner with space for the mounting of a gun.

¶About 1,000 electric motors, ranging from 7 to 50 hp., will be used in operating the locks, pumps, bridges, emergency dams and gates of the Panama Canal.

STEAM PIPES THAW FROZEN GROUND

Mining in Alaska is restricted because of the long and severe winters, and the ground remains frozen to considerable depth. An ingenious method of combating this condition is illustrated in the photograph, where miners are seen driving ⅜-in. pipe into the ground. Steam is forced into the pipes under strong pressure, and in this manner the ground is thawed so that it can be worked.



Courtesy The Valve World

The Long Alaskan Winter Freezes the Soil to Great Depth, Rendering Mining Difficult. Patches of Ground are Thawed Out with Live Steam

New Detachable Hook, in Combination with Either Scaling Ladders or Life Rope, Aids Firemen in Rescue Work or Fire Fighting

DETACHABLE HOOK FOR USE WITH FIRE LADDERS

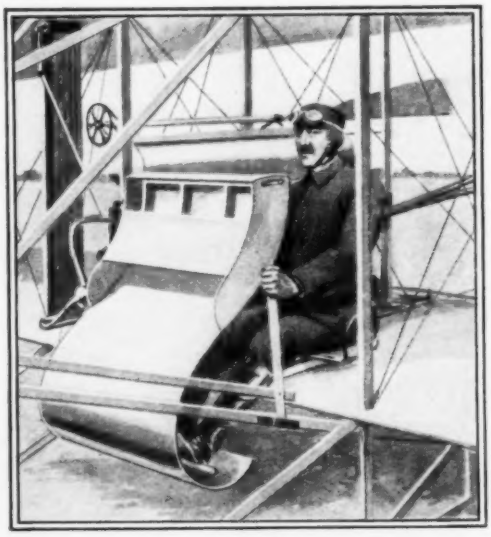
While designed primarily for use with fire ladders, a detachable hook recently invented has a wide adaptability in connection with construction work of all kinds in which ladders may be employed. The hook provides a simple, convenient and inexpensive attachment for ladders, whereby any ordinary ladder may be converted into a scaling ladder, and the hook may be applied to the ladder, removed from it or transferred from one ladder to another quickly and easily. Fire departments find this useful in connection with the life-line section, and a total weight of 1,150 lb. has been demonstrated safely and successfully on this hook. Heretofore such hooks as have been used in scaling ladders have been permanently attached to the ladder. Thus when an old hook or ladder became broken or impaired a new ladder had to be provided.

MAHOGANY USED TO IMITATE WALNUT

A case of wood staining that has attracted considerable attention was that of staining mahogany to represent walnut. This seemingly purposeless use of one valuable wood to imitate another came about from the fact that a walnut finish was wanted for a room at a time when walnut of the exact size and kind was not available. Owing to the similarity in grain and texture in the two woods the imitation might deceive even an expert.

CURVED WINDSHIELD FOUND EFFECTIVE

A French scientist has constructed a windshield with a curved surface which has been found equally effective when used on an automobile, an aeroplane, a dirigible or on shipboard.



Curved Windshield Attached to Aeroplane

When the wind strikes an obstacle like a wall, it is observed to "jump over," leaving a region of calm which extends above the top of the wall, so that an observer looking over is shielded from the effects of the wind. The new curved windshield is a deflector of sheet metal bent into a curved body, with a smaller and similarly curved top, hinged to permit adjustment to varying winds. Placed on an automobile, this curved deflector protects the driver and passengers not only from the wind but also from dust and insects so effectively that they can ride comfortably without goggles and smoke as if sitting in a closed room. On an aeroplane it works as well. Drops of oil projected from the engine are thrown aside instead of spattering into the eyes of the pilot or smearing his goggles. On board ship it is equally effective when applied to deck chairs, and French military authorities have installed this form of windshield on several dirigibles.

¶Over 28,000,000 corncob pipes, valued at $500,000, were turned out last year by six factories in Missouri.

A MILITARY INNOVATION IN INDIA

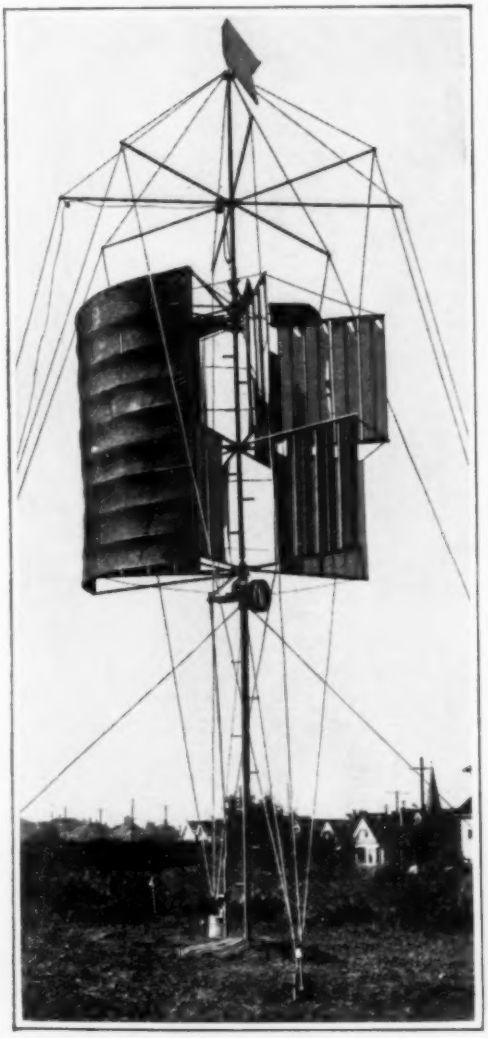
A detachment of 35 men on motorcycles and four motor cars equipped with machine guns has recently been added to the cycle force of the Calcutta Rifle Battalion. Possessing the only machine guns so far mounted on cycle-cars, this detachment is extremely mobile, capable of proceeding at the rate of 40 miles an hour, thus making it invaluable in case of riots, or to hold threatened bridges, and the like. The machine gun weighs 60 lb., and the tripod 48 lb., while the ammunition box with one filled belt weighs 21 lb. The detachment also carries rifles.

A Motorcycle Machine-Gun Detachment

Courtesy The Sphere

TOWERLESS WINDMILL IS TIRELESS WORKER

A novel windmill manufactured in Portland, Ore., is supported by a tubular column, instead of the usual tower. The fans are arranged in two sections, four in each, and are of galvanized iron, concave, and so adjusted that they quickly receive the full propelling force of the wind, while on the return they are shielded behind a movable screen of canvas. The shield is kept in the correct position by the tail vane, moving about as the wind shifts. Ball bearings are used on all wheels. The steel tubular column is kept in rigidly upright position by guy cables attached to the top of the column, trussed and anchored, and by a secondary set of cables guyed beneath the revolving wheel. Steel spikes set into the column form steps by which the machinery is reached for lubrication and repair.



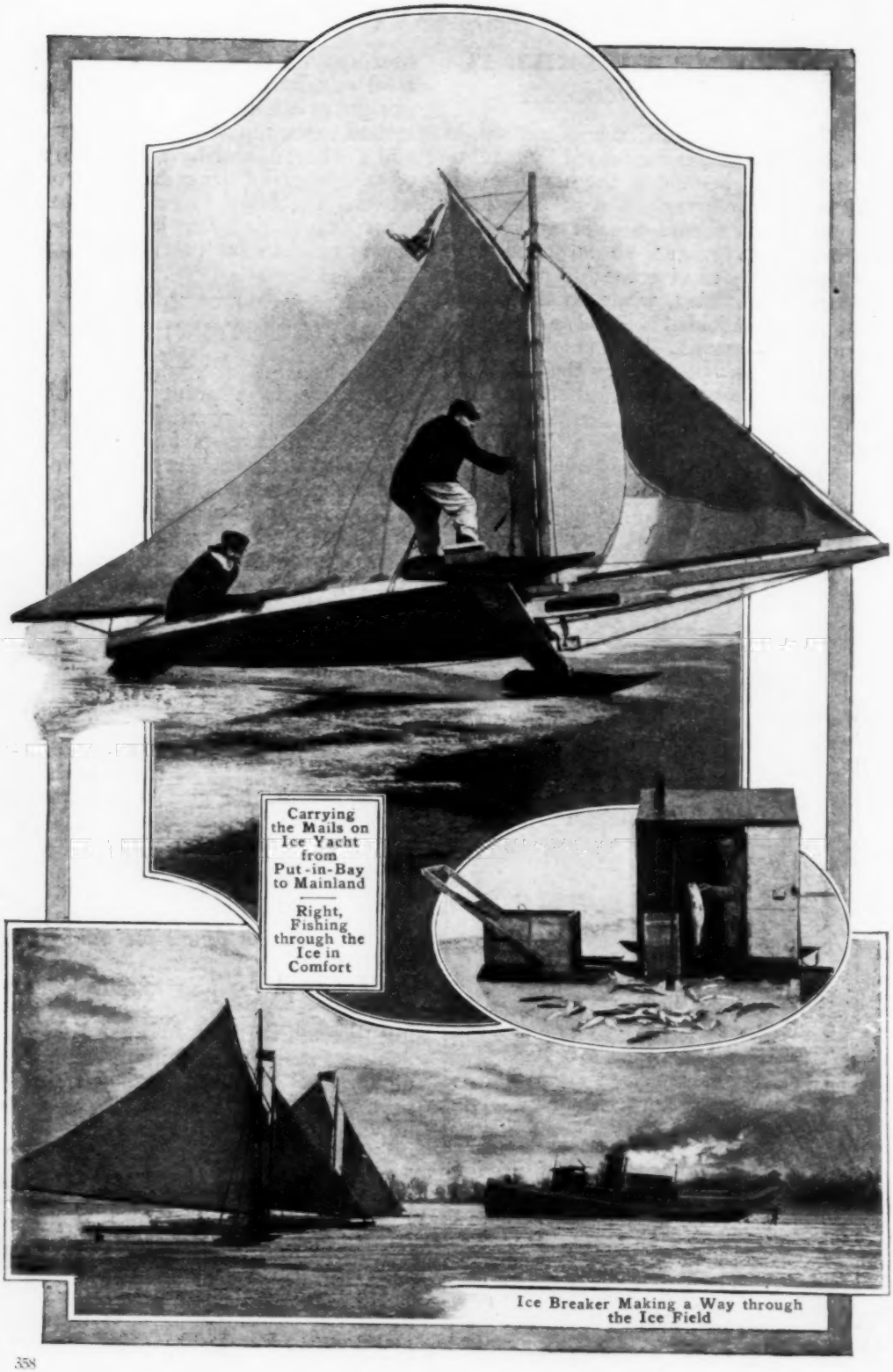
New Idea in Windmill Construction

CARRYING THE MAIL ON ICE YACHT

If there is a point south of the Alaskan boundary where the United States mail carriers have to contend with adverse weather conditions paralleling those of the Arctic regions, it is at Put-in-Bay, that famous island in Lake Erie where Perry won his victory a century ago. Separated from the Ohio mainland by 12 miles of open water, the coming of winter brings hardships to the men whose daily task it is to traverse the distance laden with the mails. Few have been the days in the past 14 years, however, when the weather was so inclement that the trip could not be made. A stout sailboat is the usual means of communication, but when the ice closes, and boating is impossible, the ice boat is called into play, and the distance is traversed in record time. An automobile has been driven over the ice in 17 minutes, from Port Clinton on the mainland to Put-in-Bay, but the flying ice boat made the trip in 14 minutes.

Here, too, is one of the most favorable places for the winter sport of fishing through the ice. A canvas-covered fishing shanty, containing a sheet-iron stove, and equipped with cushioned seat, makes this endurable even in howling winds and bitter cold.

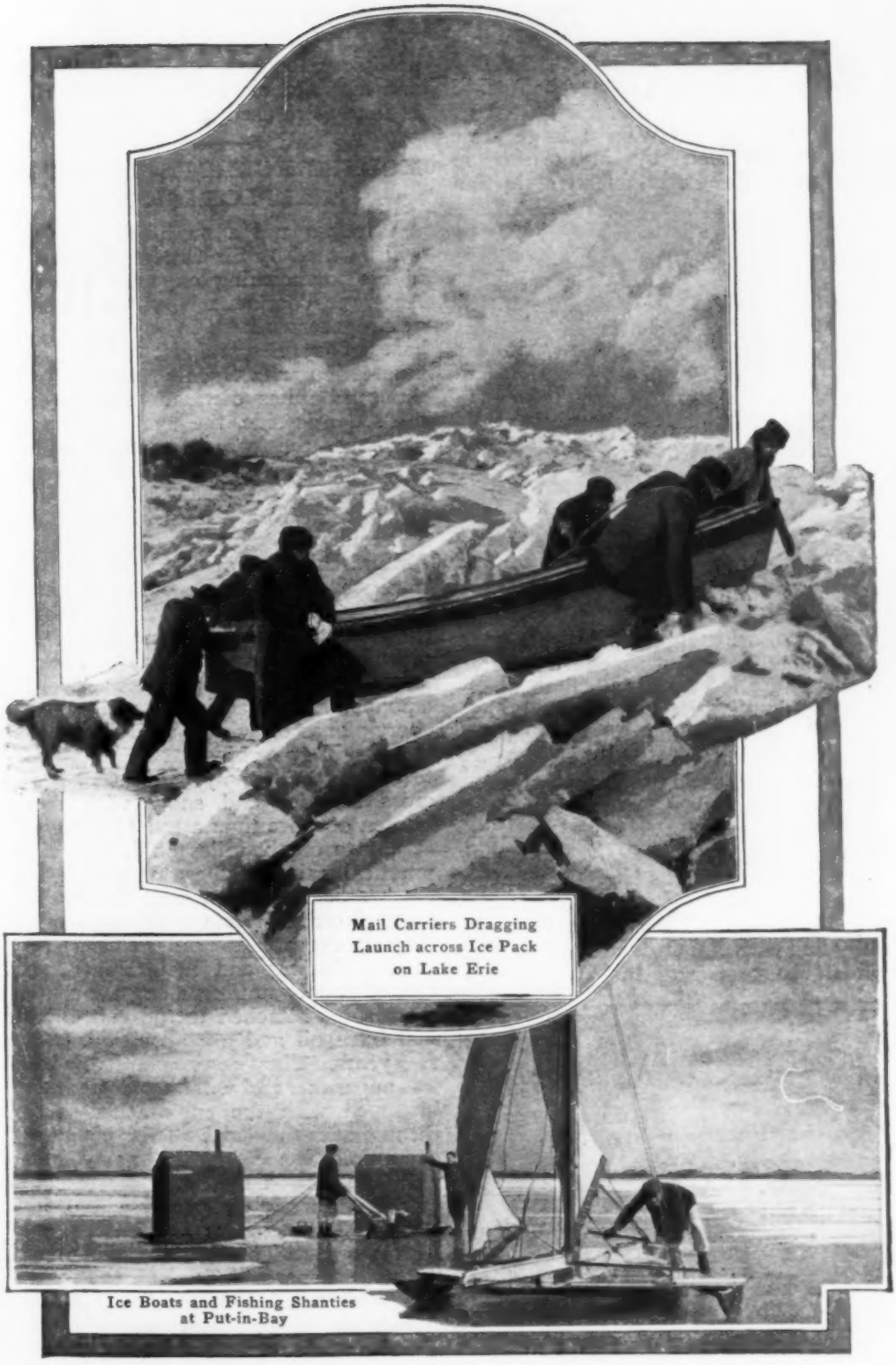
Carrying the mails in an ice yacht has distinct advantages—a thrilling ride, a hearty welcome and an opportunity to coax from beneath the ice a dozen or more pickerel, perch and saugers. Little wonder that in 14 years few days have been found too inclement to bring the mails from the mainland to Put-in-Bay.



Carrying the Mails on Ice Yacht from Put-in-Bay to Mainland

Right, Fishing through the Ice in Comfort

Ice Breaker Making a Way through the Ice Field



Mail Carriers Dragging Launch across Ice Pack on Lake Erie

Ice Boats and Fishing Shanties at Put-in-Bay

HE WHO RUNS MAY READ THIS SIGN

Outdoor publicity on a large scale was undertaken by authorities in charge of the Portola festival in San

Sign as Long as Five City Blocks on Hillside

Francisco, when upon a hillside they dug huge trenches shaped in letter forms and filled them with lime, spelling the words, "Portola Festival, Oct. 22-25." In selecting the location for this great sign, Yerba Buena Island, opposite San Francisco, was chosen, and the side facing the city being the first object seen by travelers entering San Francisco from the east, was found the most conspicuous site. The entire sign is 1,400 ft. long and is 136 ft. from top to bottom. Each letter is 48 ft. long and each line in the letters is 8 ft. wide. In preparing the site, it was necessary to grub out 500 small trees and innumerable bushes. Thirty tons of lime were used in the trenches.

Putting the L in Festival

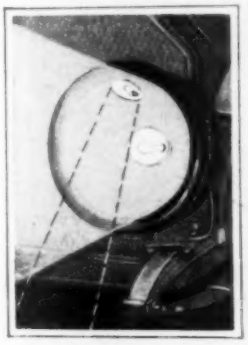
MODERN EQUIPMENT USED IN EXPLORATION

Wireless and a modified aeroplane will be used by Sir Ernest Shackleton in his forthcoming expedition to the Antarctic continent. By such means he proposes to keep in touch with his bases of supplies, and also to have communication with Sydney, more than a thousand miles distant. Starting on the Atlantic side, the exploring party will cross the frozen continent, which is considerably larger than Europe, emerging on Ross Sea, 1,700 miles in a straight line from the first base. Here a second ship will await them, near Amundsen's base on the great ice barrier. The explorer will determine whether the Victorian range crosses the Antarctic continent and lies in the direction of the Andean range. Shackleton has adopted a motor sledge, equipped with aerial propeller and short planes or wings, which it is believed will give sufficient lifting power to enable the heavily laden sledges to cross soft ice and snow with their burden of more than a ton of supplies, at a rate of six miles an hour. The practical value of these aero-ice gliders has been demonstrated during the past winter in Siberia and Canada, and they are expected to render efficient aid in establishing and maintaining advanced supply stations along the route. Both ships attached to the expedition will burn oil and are provisioned for two years. They carry complete wireless apparatus and will keep constantly in touch with the exploration party throughout the trip. This constant communication with the party and with the station on the opposite side of the Antarctic continent, will make it possible to render aid in case of storms or accident, while communication with the world, through the wireless station at Sydney, will apprise civilization of the progress made and give the news of the world to the mem-

bers of the expedition. It will be remembered that Doctor Mawson was able, by means of wireless, to advise the authorities at Sydney of Amundsen's success over thousands of miles of frozen sea, and while Shackleton's base on the Atlantic side is a long way from Sydney, there appears no valid reason why the experiment should not be a success.

NEW-TYPE AUTOMOBILE LAMP WITH DOUBLE BULB

A headlight for automobile use which permits brilliant light in the country and a less intense light on city streets has been devised. A 12-in. reflector is fitted with a 16-cp. main bulb, and a 2-cp. city light bulb with a little semireflector is let into the top of the main reflector. The wiring is double so that the lights may be independently controlled.



TOW GREAT FLOATING DOCK FROM HOLLAND TO JAVA

A bigger towing job than that when the dry dock "Dewey" was towed from the Chesapeake to the Philippines was successfully completed when the 14,000-ton floating dry dock which left Nieuwediep, Holland, June 23, 1913, arrived safely at Surabaya, Java, recently. The tow was handled by two ocean-going tugs of Amsterdam and required the exercise of the greatest skill and patience. The towing fleet was equipped with complete wireless apparatus as a safeguard against untoward events. The United States dry dock "Dewey," at that time considered gigantic, only weighed about 11,000 tons.

CHIN LIFTER MAKES CHILD SIT UP WHILE WRITING

A common fault in beginners is the tendency to stoop over the desk when practicing penmanship. In order that children shall sit erect when they write, a device called a "chin lifter" is now being used in some schools, which keeps the child at the correct distance from the work. The device is adjustable and may be arranged for children of any size.

Girl Writing with Chin Lifter in Use

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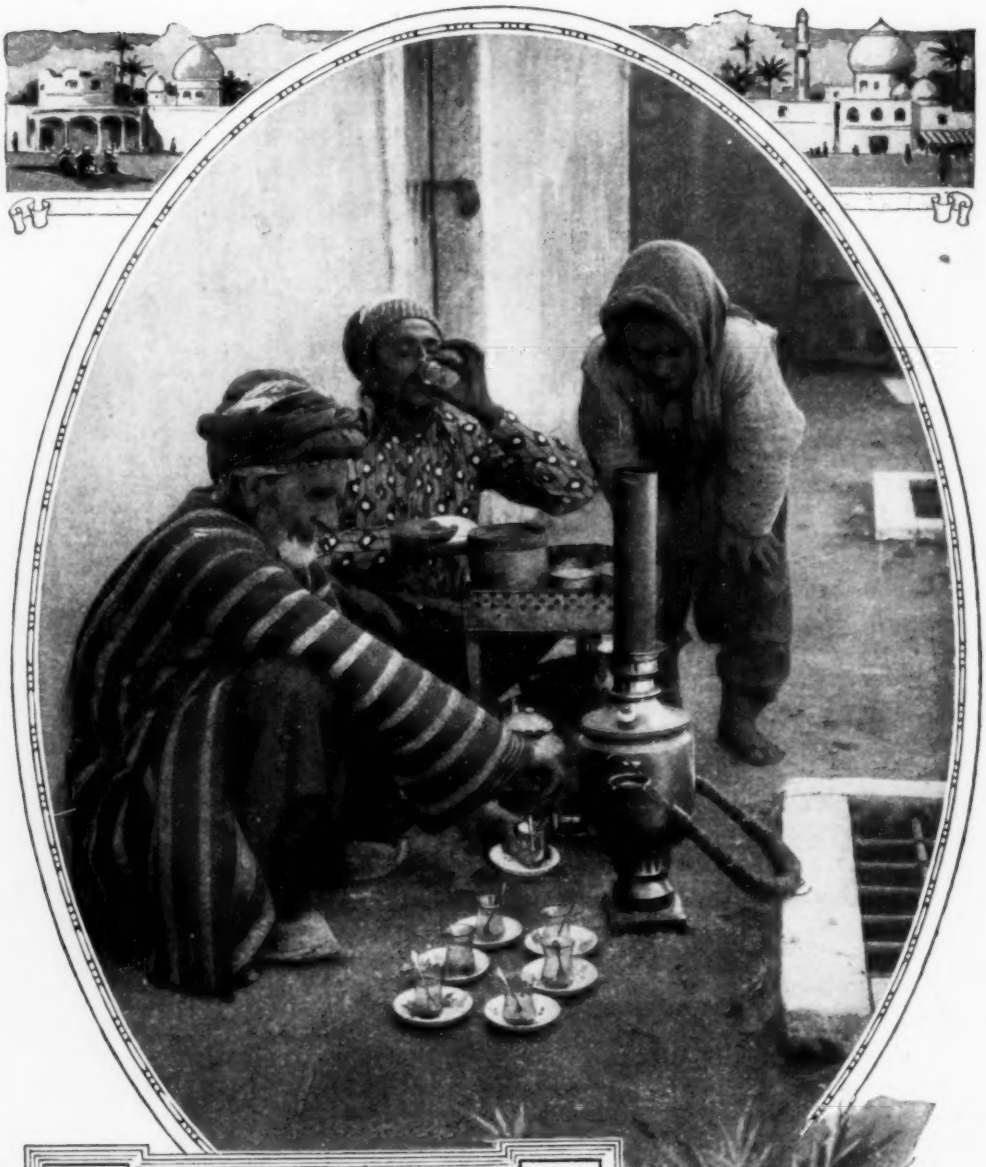
TRAP FOR LARGE GAME MADE FROM LOG

A figure-4 trap made from a section of a hollow sugar-pine log caught a small black bear, several timber wolves and a number of raccoons during the past summer in the Tahoe National Forest, California. The trap was constructed by a government forest ranger, who uses a sheep's head for bait.

Rustic Trap That Catches Bears Alive

THE FIREPLACES OF ALL THE WORLD—III



Bagdad, Famed as the Scene of Many of the Stories in the "Arabian Nights," is Now But the Decayed Capital of a Turkish Province. The Tea Merchant, Squatting beside His Samovar in the Crooked Street, is a Familiar Sight. The Copper Urn is Filled with Water, Heated by Charcoal within the Central Pipe

THE FIREPLACES OF ALL THE WORLD—IV

Indian Cooking is Primitive beyond Description. The Navajos Use an Open Fire, Sometimes in a Little Shallow Depression in the Ground, More Often Just a Bit of Brush or Broken Branches, Which Admits of Few Culinary Graces. With the Sand for a Hearth, with Sagebrush for Fuel, with No Chimney But the Unbroken Blue of the Arizona Sky, the Navajo Lives the Simple Life

HOOTS FROM HORNS GIVE FIRE ALARM

Hooter fire alarms for rousing a whole community or only the members of the fire department, as desired, are now being installed in a number of the smaller cities. Each

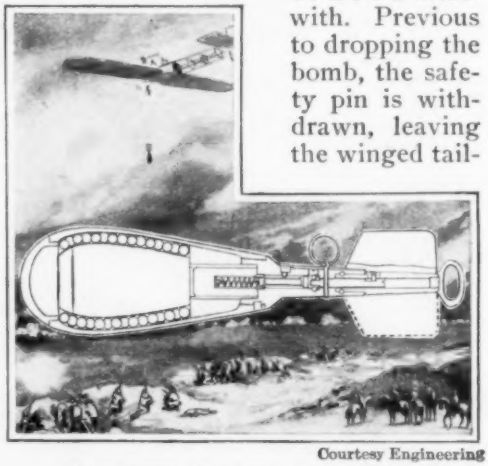
hooter consists of a horn and electrical instrument, the whole being practically a special form of telephone receiver actuated by a strong alternating current of high frequency supplied from a central station. When the current is sent through the coils a succession of blasts or "hoots" is produced which is sufficient for rousing an entire community from slumber. If not available, the alternating current can be produced by converting the continuous current of a lighting or power circuit or of a battery of dry or wet cells by means of a vibratory generator. Where the system is to give a general alarm the city is divided into districts and each district is provided with a vibratory generator, and, as ordinarily arranged, the alarm is given only in one district. In some cases, especially in small communities, hooters are placed only in the homes of members of the fire department. The alarm is started by pushing the button in an annunciator or "push," of which a number are located at convenient points, and the remainder of the process is automatic. A switchboard in the central fire station indicates the point from which the alarm was turned in.

GERMAN BALLOON BREAKS WORLD'S RECORD

The world's record for long-distance flights by spherical balloons was broken recently when the German balloon "Duisburg" rose from a village in Saxony and descended 87 hours later at a point in European Russia near the Siberian frontier. The total distance covered in this flight was a fraction of a mile more than 1,738 miles. The longest previous flight was that of a French balloon which, in March, 1913, flew from Paris to a point near Kharkov, Russia, a distance of 1,492 miles.

EXPLOSIVE BOMBS FOR USE WITH AEROPLANES

Bombs for use in aerial warfare are now being considered by several governments, one type of which is illustrated herewith. Previous to dropping the bomb, the safety pin is withdrawn, leaving the winged tail-



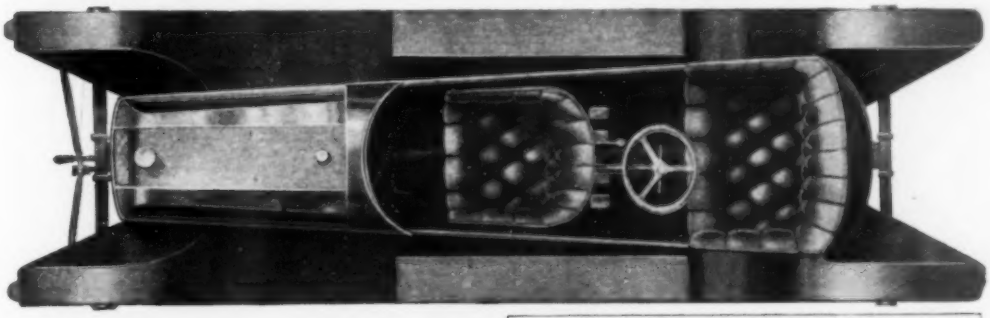
Courtesy Engineering

New Weapon for Use in Aerial Warfare

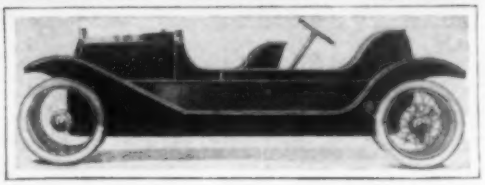
piece free to rotate under the action of the air in flight. Steadiness is insured by this means, and whether the bomb is simply dropped or is fired from a spring gun, the firing mechanism is so sensitive that explosion ensues on very slight retardation of flight, due to impact on water, soft earth or snow, at any angle of incidence, even so low as 5°. The charge is 4 lb. of explosive and 340 steel balls, weighing 6 pounds.

AN AMERICAN CYCLECAR

An interesting development in the cyclecar is shown by an American manufacturer in a narrow-gauge, low-hung, two-passenger tandem car, with several novel features. The frame and body are combined, and the propeller shaft is inclosed in a tube, 5 in. above the floor. This gives a road clearance of but 9½ in. with the passenger's feet 14 in. from the road. In this way the center of gravity is brought low, tending to stability. The steering is from the rear seat, which is set 3 in. higher than the front seat, and the steering column is 2 in. off center, giving a clear view of the road to the driver. The motor is four-cylindered, water-cooled, with 5-in. stroke and is rated at 12-15 hp. A friction drive is provided and the wheel base is 120 in. A parcel box is provided in one model taking the place of the front seat.



New American Tandem Cyclecar in Which the Driver Sits behind the Passenger



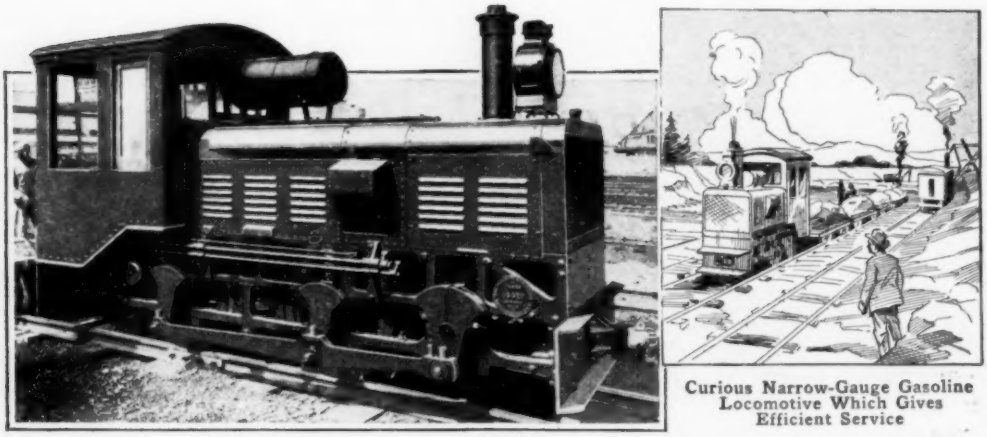
HEAD CARVED BY ESKIMO FROM SPRUCE KNOT

Inside the arctic circle overlooking a steep bank of the Yukon River a spruce knurl, or knot, several feet high stood for years. An Eskimo trapper found a big campaign poster that bore the picture of William H. Taft. During the long winter, when he was not occupied with his work, this rude sculptor put in his spare time carving the knot into a likeness of the former president. When it was completed to his satisfaction, he secured several pieces of moose hide and fashioned a scalp and moustache. Travelers in the interior of Alaska viewed the carved knot with interest, and one of them painted a sign "Vote for Taft," and placed it near the likeness, but contrary-minded visitors have riddled the sign with bullets from their rifles. None, however, has been disrespectful enough to shoot at the image.

An Eskimo Artist Carved This Statue in Wood

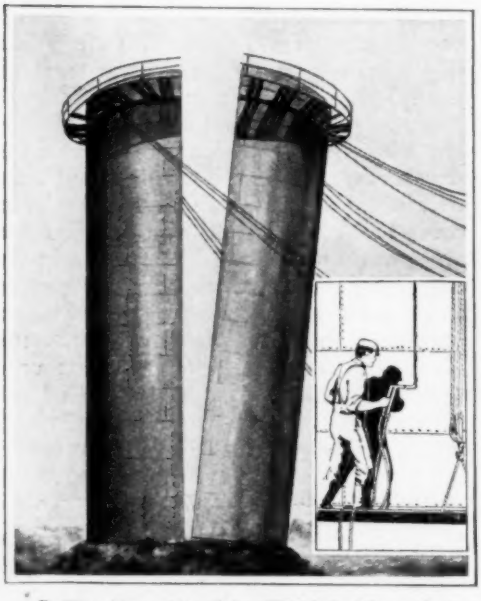
¶The first cargo of lumber from the Tongass National Forest in Alaska, recently received in San Francisco, consisted of 1,500,000 ft. of Sitka spruce.

GASOLINE LOCOMOTIVE FOR TERMINAL WORK



Curious Narrow-Gauge Gasoline Locomotive Which Gives Efficient Service

A powerful industrial locomotive, using gasoline for motive power, is in use on the lake front in Chicago, hauling cars of dirt for filling in where improvements are contemplated. A steel frame is built inclosing the wheels, which are 30 in. in diameter. The engine, which is narrow-gauge, has a width of 4 ft. 8 in. and is 12 ft. 4 in. long. Its height is but 7 ft. 6 in., as it is used in an industrial tunnel, and it weighs seven tons. The short wheel base, 4 ft., enables it to make sharp turns, and it has been found to be a sturdy little worker, adapted both to the outside tracks with heavy grades and to the tunnel where electric propulsion is used for ordinary work.

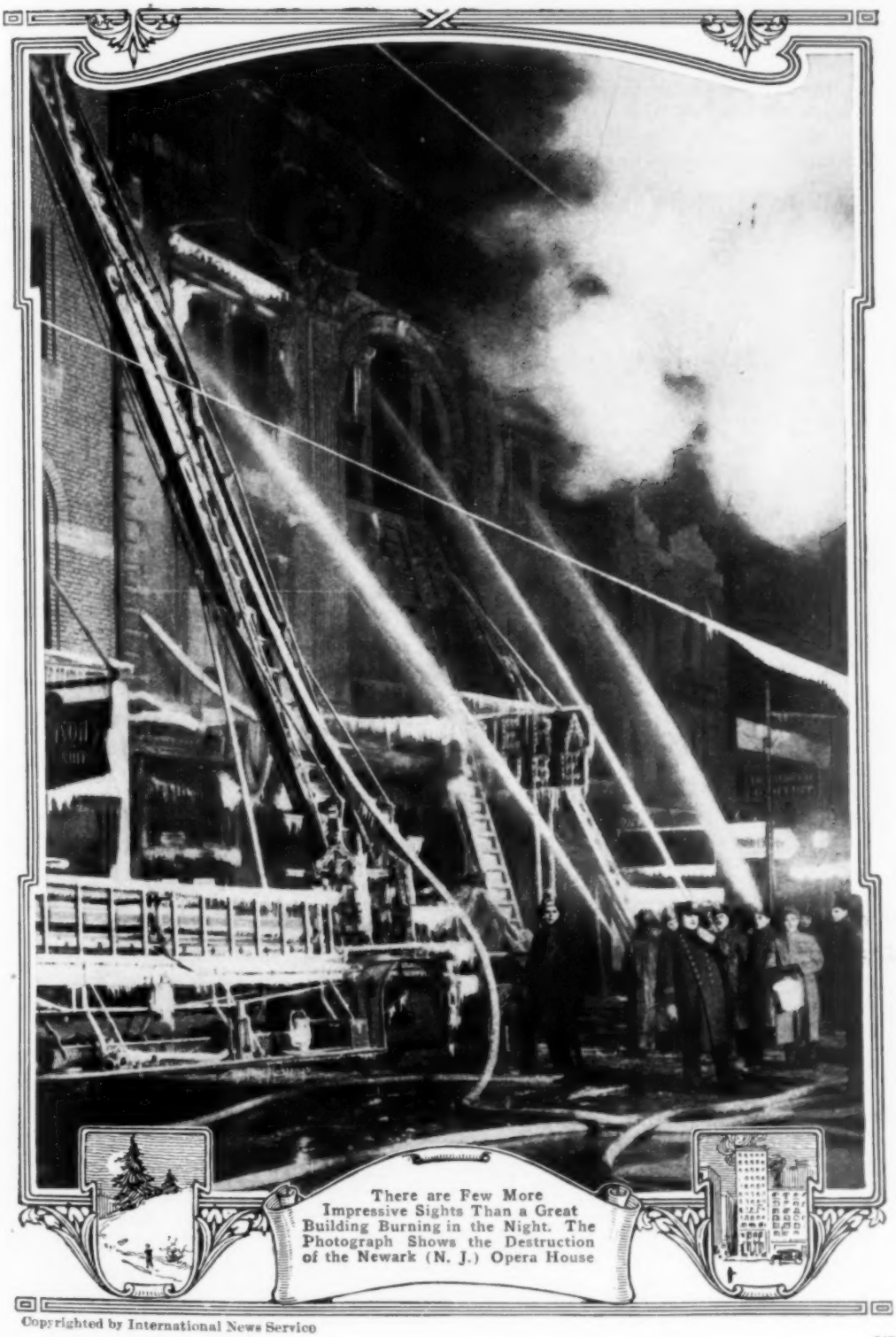


Pulling Down Standpipe Which had been Cut in Two by Oxyacetylene Torch
Insert—Cutting Standpipe with Torch

STANDPIPE REMOVED BY ACETYLENE TORCH

A disused standpipe which had been sold for junk was cut in two and quickly disposed of by the use of an acetylene torch. A staging with operator was raised to the top of the tank and as fast as he cut, which was about a foot a minute, with the oxyacetylene cutting torch, he was lowered until the ground was reached. The process was repeated on the opposite side, and then the tank was cut entirely around the bottom. A set of tackle was made fast to each corner, at the top, and each severed half was pulled over. The tank was 60 ft. high and 40 ft. in diameter and the operation took only a few hours, while, if a staging had been built inside, it would have taken several weeks for the men to have cut it by the usual method of sledge hammers and cold chisels.

FIGHTING FIRE WHEN THE MERCURY IS BELOW ZERO



There are Few More Impressive Sights Than a Great Building Burning in the Night. The Photograph Shows the Destruction of the Newark (N. J.) Opera House

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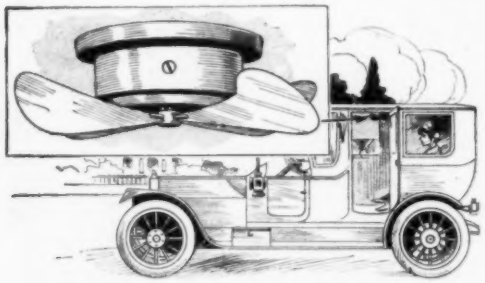
SMALL ELECTRIC FANS FOR LIMOUSINES

Limousines and other inclosed automobiles are so hot and stuffy in summer weather that small electric fans,

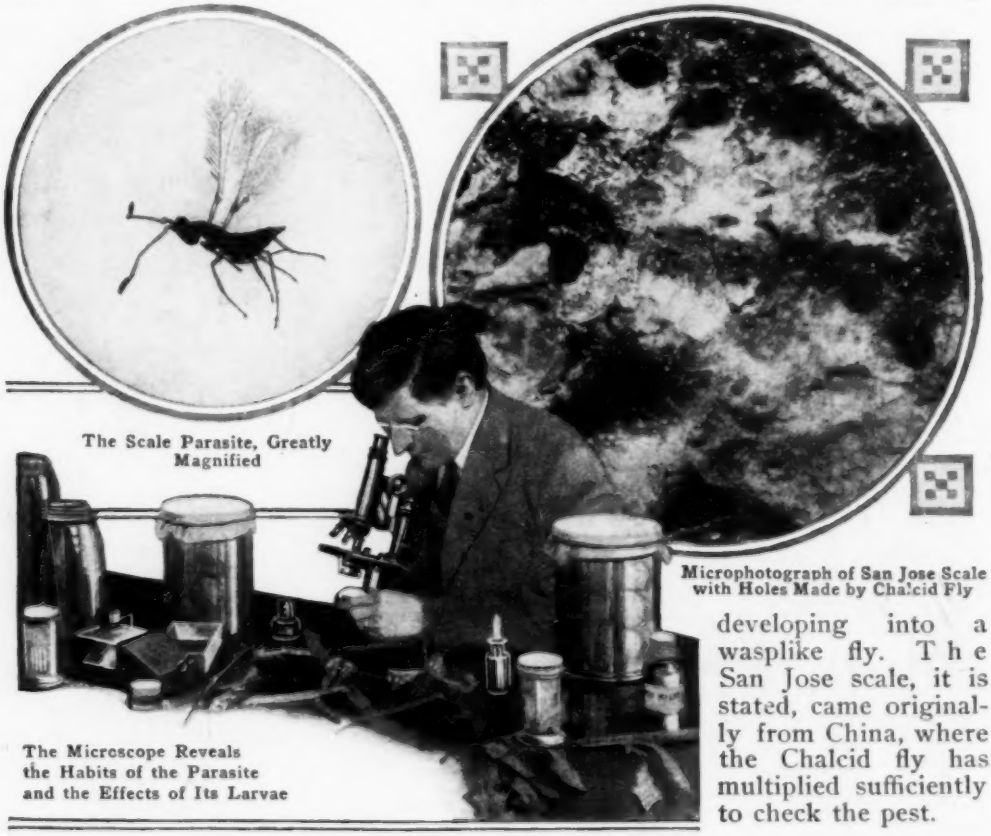


Small Electric Fan for the Interior of a Limousine Automobile

especially designed for them, have come into use in England. The fan and motor are flat and compact, arranged to fasten to the inside of the roof of the limousine. In motor design they are exactly like the larger fans—which means that they need no more attention than a little oil once a year.

PARASITE WHICH DESTROYS SAN JOSE SCALE

A parasite which destroys the dreaded San Jose scale has been found by scientists, and in Pennsylvania, where the new insect has been given an opportunity to demonstrate its effectiveness against the pest, it has been completely successful. The new enemy of the scale is the Chalcid fly, related to the wasps, and is one-fiftieth of an inch in length. It is yellowish in color and has hair on its wings. It destroys the scale by boring a hole through the scale and laying an egg within it. This egg develops into a worm which thrives on the scale, eating its way out of the shell and finally developing into a wasplike fly. The San Jose scale, it is stated, came originally from China, where the Chalcid fly has multiplied sufficiently to check the pest.



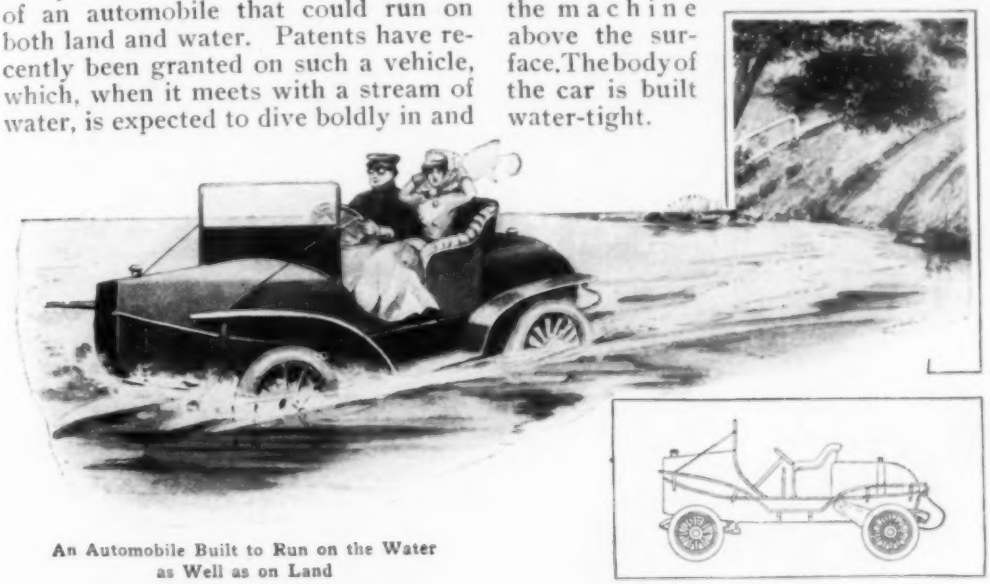
The Scale Parasite, Greatly Magnified

Microphotograph of San Jose Scale with Holes Made by Chalcid Fly

The Microscope Reveals the Habits of the Parasite and the Effects of Its Larvae

COMBINED AUTOMOBILE AND BOAT

Two or three years ago the automobile journals were full of illustrations of an automobile that could run on both land and water. Patents have recently been granted on such a vehicle, which, when it meets with a stream of water, is expected to dive boldly in and swim across. Fenders, somewhat similar to mudguards in shape, are arranged on each side of the hood. The water, striking against these fenders, has a tendency to keep the "bow" of the machine above the surface. The body of the car is built water-tight.



An Automobile Built to Run on the Water as Well as on Land

DIRIGIBLES CARRY MANY PASSENGERS

Despite the fatalities attending the Zeppelin airships attached to the German navy, passenger-carrying dirigibles last year made many trips and covered long distances without accident. The airships "Hansa," "Sachsen" and "Viktoria Luise" during the year 1913 carried 12,382 passengers. The "Hansa" in 210 trips covered more than 15,000 miles, carrying 4,086 passengers. The "Sachsen" made 206 trips and the "Viktoria Luise" 400.

SANITARY POCKET DRINKING TUBE

Since the banishing of the common drinking cup, many kinds of collapsible pocket cups have been invented to take its place. But they are always bulky to carry and are seldom at hand when wanted. A handy substitute that has recently appeared is a patented drinking tube that does not bulge a vest pocket. It is a piece of nickelplated brass tubing, $\frac{3}{16}$ in. in diameter and about 5 in. long, shaped like a letter "S" with one curve straightened out. It can be used for drinking out of a

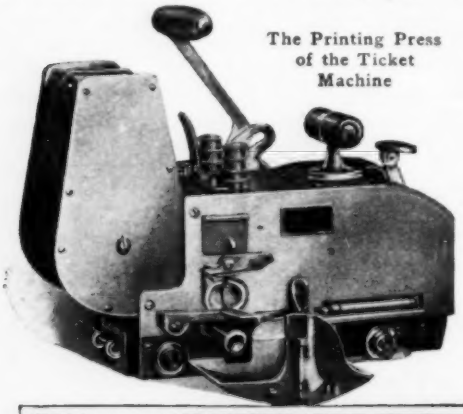
Using a Sanitary Pocket Drinking Tube Instead of a Cup

doubtful cup, a faucet, a sanitary fountain, or even a soda-water glass.

¶ Extinguishing fires by smothering with the exhaust gases from the engines is the latest method of fighting fires aboard ship. These gases contain only 9 per cent of oxygen, while 15 per cent is required for combustion.

RAILWAY-TICKET PRINTING MACHINE

A ticket-printing machine that greatly simplifies the work of the railroad ticket agent is being installed in a number of offices in Germany. This machine, which is not complicated and which can be worked as fast as the ordinary date-stamping machine, prints the ticket in complete form, and keeps a record of the number of tickets sold and the amount of cash taken in, all in one operation. A cast-iron table which forms part of the machine carries a series of blocks, arranged in station order for printing the tickets, and the printing press is mounted on a slide so that it can be moved to any part of the table and set over any desired block. The tickets are numbered automatically in consecutive order.

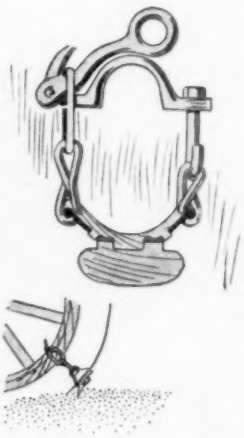


The Printing Press of the Ticket Machine

Ticket Office Equipped with Two Machines

ANTISLIP MUD HOOKS FOR AUTOMOBILES

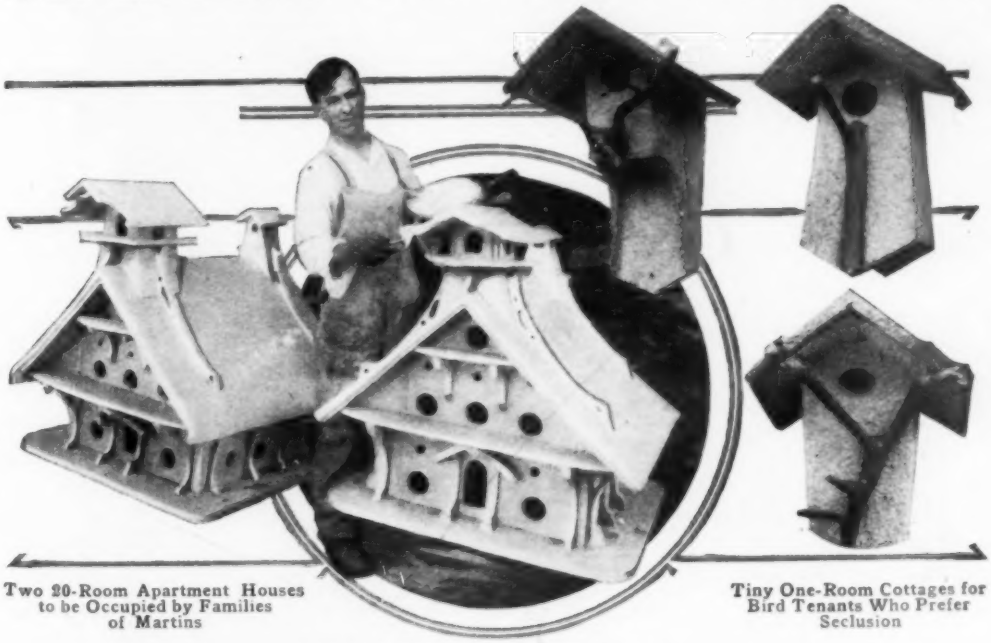
To prevent automobile wheels from slipping and spinning in mud or loose sand a mud hook has been invented which increases the tractive power of the driving tires when it is most needed. It consists of a hook or spoon hinged to a saddle which is held on the tread of the tire by a chain and clasp over the rim. When the wheel rolls over a smooth road, the spoon lies flat against the tire; but as soon as the wheel slips or spins, the spoon is raised by friction and projects about 2½ in. from the tire. As it is held at an angle of 60 deg. with the tread, it gives the wheel a good grip in sand or mud.



Operating the Ticket-Printing Machine

AN ARCHITECT OF BIRD RESIDENCES

Cosy little cottages and large roomy apartment houses designed to suit the various tastes of fastidious bird tenants are being built by an Ohio man. The material used in the construction is cement stucco, modeled with a trowel. Some birds, like martins, prefer to live in families under one roof; for them he builds 20-room colonial homes of several stories. For birds who like seclusion, he constructs tiny one-room cottages arranged to suit the tenant's taste. Hutlets for wrens, cotes of a different shape for bluebirds, thrushes, etc., and tiny cottages for woodpeckers, flickers, and birds of their class. The bird houses are practically indestructible and very artistic in design.



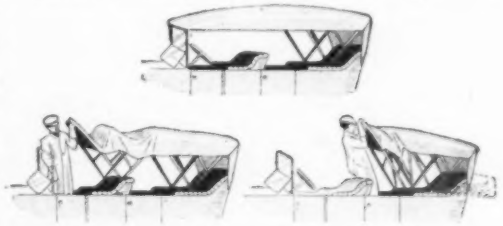
Two 20-Room Apartment Houses to be Occupied by Families of Martins

Tiny One-Room Cottages for Bird Tenants Who Prefer Seclusion

Artistic Birdhouses Made of Cement Stucco

AUTOMOBILE TOP MANAGED WITH ONE HAND

An adjustable top for the automobile, which may be extended over the whole car or folded back snugly behind the rear seat and covered, has been patented not long since. The top is attached to the car, at one point only on either side, at the rear seat. Two main bows carry the rear half, supported by frames of steel tubing, and by an intermediate bow attached to the main frame. The forward part is hinged in the middle of the frame, which extends around its edge. A



Flexible Cable Prevents Sagging in New Adjustable Automobile Top

flexible cable, invisible, is attached to the intermediate bow of the rear half of the top, running over two pulleys in the forward main bow, giving the top support and taking the strain off the fabric, which is of cravenette or mohair. The forward end of the top is attached to the windshield by straps, which, when loosed, permit the top to be easily pushed back and folded.

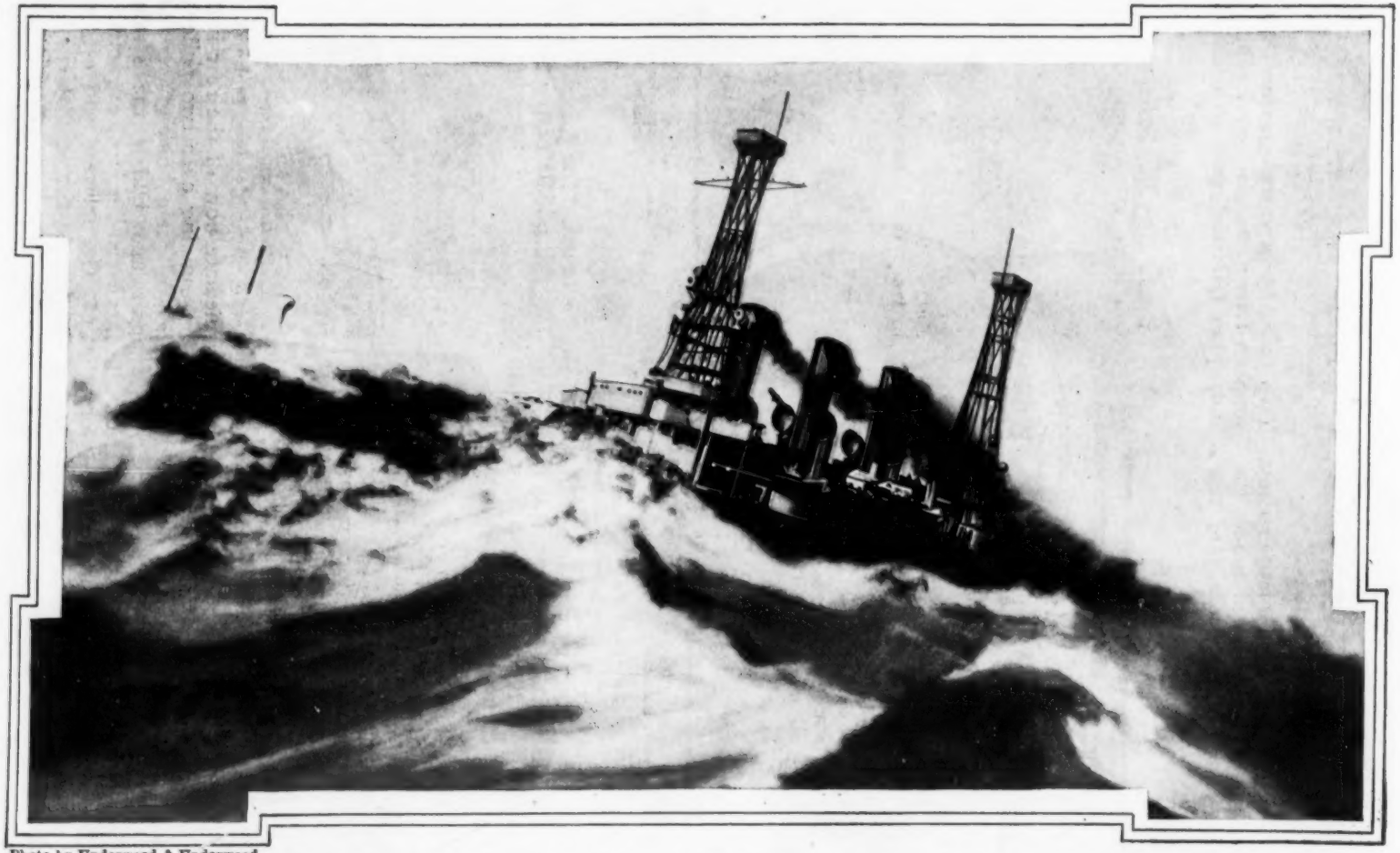
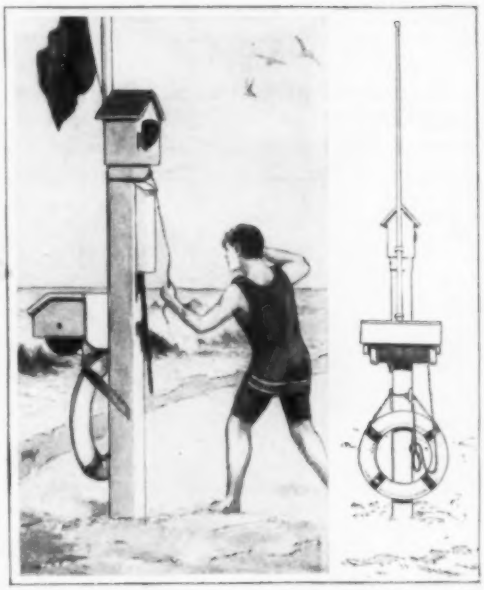


Photo by Underwood & Underwood

Gripped by a Five-Day Gale, the Atlantic Fleet, Homeward Bound from the Mediterranean Cruise, Rode Out the Storm, But the Battleship "Vermont" was Partly Disabled. Huge Waves Lifted Her Stern Out of Water, Causing Her Propellers to Race. The Unequal Strain Snapped Her Starboard Shaft, Forcing Her to Proceed to Port under One Engine Only

SENSIBLE LIFE-SAVING EQUIPMENT

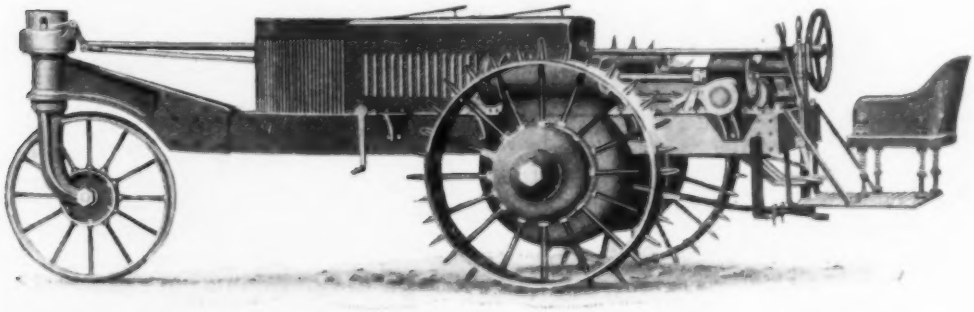
On the beach at Ocean Park, about 15 miles from Los Angeles, a new life-saving station has been installed which is notable because of its adaptability to immediate use. Upon a support close to the water's edge, a post is driven, equipped with a life preserver, a gong and a signal flag, and an electric signal connected with the main life-saving station. In case of danger, any by-stander pushes a button on the post which rings a bell in the main station, and the life-saving crew is on the spot in a few minutes. Meanwhile the life preserver is carried to the surf and flung to the one in peril. The gong is rung and the flag hoisted to direct the crew to the spot. Several lives have been saved in this way since the new stations have been installed.



A First-Aid and Danger Signal for the Beach

NEW TRACTOR DESIGNED TO MEET FARM NEEDS

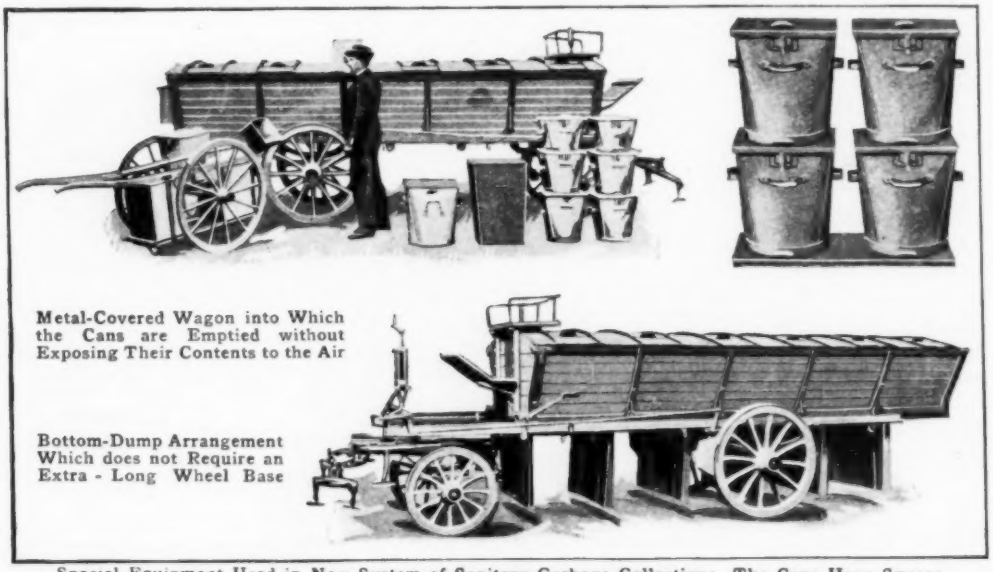
A number of special features which serve to make it particularly adapted to farm work are embodied in a tractor that has just been brought out. This tractor has only three wheels and the chassis consists of a strong triangular frame of structural-steel members firmly riveted together. The motor operates on kerosene or distillate as well as gasoline. An extra-strong differential is provided and there is a differential lock by which the full tractive effort may be thrown on both rear wheels whenever necessary. The rear wheels are provided with tapered holes for the insertion of spuds or toe holds, which may be easily attached or removed and which are furnished in different designs and lengths to suit the soil conditions. The final drive is by means of a belt, and with the belt off the pulley the motor may be used for threshing, pumping, bailing hay, and other farm operations. This machine has one speed forward and reverse and is capable of pulling four or five plows two miles an hour.



Farm Tractor That is Readily Converted into Power Plant for Threshing and Other Farm Operations

SANITARY COLLECTION OF GARBAGE

A system of ordorless, flyless garbage collection, which is in use in many European cities, has been brought to this country and is being tested in New York City. Sanitation is secured in this system by the use of wagons and cans that are always tightly closed, even while the cans are being emptied into the wagons, so that there is no chance for odors to escape or flies to gather. The special cans are like ordinary garbage cans except that the top of each is square and has a tightly fitting sliding cover. Each wagon has an air-tight metal cover on which there are several square holes with flat covers, sliding in tracks just wide enough to fit the tops of the cans. When a can is to be emptied into a wagon, it is turned upside down and pushed into one of the tracks on the wagon's cover; as the can moves along the track, its cover slides open and the can pushes back the slide in the wagon top and empties its contents. Then as the can is drawn back along the track, the wagon cover closes and the can's cover returns to its place. At no time during the entire operation is the wagon or can open to the air. Special bottom-dump wagons with sliding bodies, that make an extra-long wheel base unnecessary, are used in the regular equipment, but the patent wagon cover can be used on any dump wagon the top of which does not reach above 5 ft. from the ground.



Metal-Covered Wagon into Which the Cans are Emptied without Exposing Their Contents to the Air

Bottom-Dump Arrangement Which does not Require an Extra - Long Wheel Base

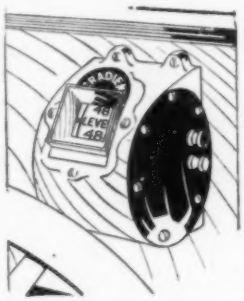
Special Equipment Used in New System of Sanitary Garbage Collection: The Cans Have Square Tops and Tightly Fitting Sliding Covers

DISPLAY MAGAZINE HOLDER OF WIRE

A very simple holder by which magazines, books and other merchandise may be advantageously displayed for sale or advertisement has been placed on the market. It is constructed of heavy wire, as shown in the illustration. The holder is made in a variety of sizes, suitable for magazines of any size and may be used to advantage in windows or other display places.

NEW GRADIENT METER FOR MOTOR CARS

A meter which indicates the gradient on which a motor car is running at any time has recently been placed on the market and is shown in the accompanying illustration. It is designed to be attached to the dashboard so as to be constantly in view of the driver. A screw is provided for setting the mechanism to level when the car is in that position, and when the car is traveling on a slope figures appear opposite the pointers, ascending slopes being indicated by black figures and descending slopes by red figures. If, for example, the figure 5 appears in black, it indicates that the car is climbing on a slope of 1 in 5. For use at night an internal electric lamp is fitted to cast its light through the scale. By means of a simple formula the approximate horsepower developed on different slopes can be easily determined.



¶Owing to discrepancies in old surveys, the acreage of mountain lands in the Appalachians as recently surveyed by the government, is, on an average, about 1 per cent in excess of the acreage claimed by the owners, while one tract in Tennessee, supposed to be 850 acres, actually contains 1,840 acres.

CANADIAN RAILROAD USES NEW TYPE PIT CAR

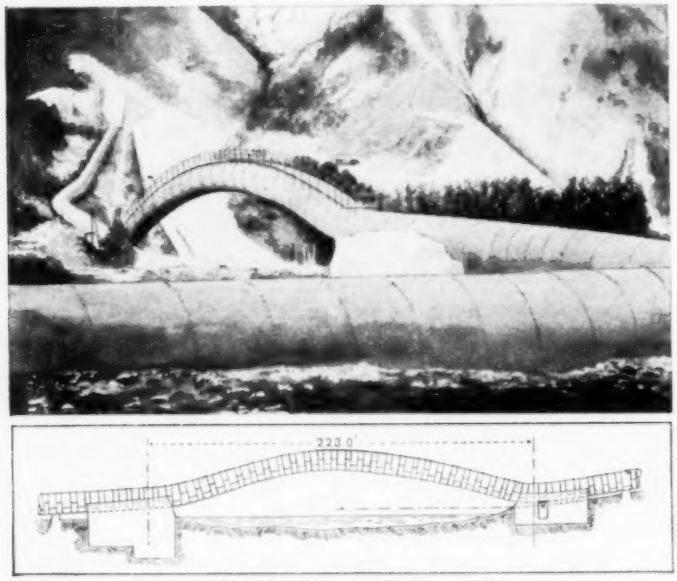
Cars of special design, having a portion of the floor removable for the purpose of carrying machinery, which if placed on the floor of an ordinary flat car would be too high for railroad clearance, have been built for use on a Canadian railroad. The opening in the floor also allows the load to be placed nearer the track, lowering the center of gravity, thus insuring greater stability on curves. The pit opening has a clear width of 6 ft. and a clear length of 18 ft., and the trucks are of extra-heavy design. The opening may be closed by means of removable sections of floors, making the cars suitable for use as standard flat cars.

Pit Car with Opening Closed, Ready for Use as Ordinary Flat Car

New Type Pit Car Showing Opening

FRENCH ENGINEERS SOLVE PENSTOCK PROBLEM

A penstock, having unusual features, conveys water collected in the French Alps into the river L'Arc. A 13,000-ft. tunnel brings the water to the forebay, whence the penstock, which is 11 ft. in diameter, conducts it to the power house. Steel plates, $\frac{5}{16}$ in. thick at the upper end and $\frac{3}{4}$ in. at the lower end, constitute the penstock. Where it bridges the river the plates are $\frac{11}{16}$ in. in thickness and are held with 1-in. rivets. The span is 223 ft., and the rise in the center of the arc, 19.7 ft. A footwalk is placed on top of the pipe.



Penstock Arching over the River L'Arc

LEATHER-SOFTENING DEVICE

A compound by means of which hard, brittle and discolored leather stock is softened and made flexible has been placed on the market. The compound is used by placing it in a tub or vat, warmed to blood heat, and immersing the leather in the liquid for 6 or 8 hours, whereupon it is taken out and dried in racks, when it is found to be plumped, bleached and pliable.

A NEW AUTOMOBILE FUEL CHEAPER THAN GASOLINE

Treated with superheated steam in the presence of pure nickel, creosote becomes transformed into a substance resembling benzol, according to an English process recently invented. Creosote is a by-product of the illuminating-gas industry and is produced in large quantities in England at a price ranging from 4 to 5 cents a gallon. When superheated and mixed with steam it is blown upon a rod of pure nickel which acts as a catalyzer. A chemical reaction takes place, incorporating into the oil hydrogen taken from the steam, changing the surplus of carbon in the creosote to a surplus of hydrogen and thus making an ideal fuel. About 75 per cent of the creosote is so transformed, and the cost is inconsiderable, giving a fuel admirably adapted for use in internal-combustion engines and much cheaper than gasoline.

AMERICAN AIRMAN LOOPING THE LOOP

By looping the loop seven times in succession in his biplane while flying over the exposition buildings at San Francisco recently, Lincoln Beachey broke the world's record for daring feats of this kind. The accompanying photograph, which was taken from a flying boat 150 ft. away, shows the aeroplane making its perpendicular climb after a swift downward rush, the machine being at this instant about 600 ft. above the ground. The perpendicular position is shown by the word "Beachey," which is painted on top of the top plane.

American Airman Emulates Pegoud's Famous Feat by Looping the Loop Seven Successive Times over Exposition Buildings at San Francisco

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DREDGING HARBORS ON THE HUDSON BAY ROUTE

Seagoing Suction Dredge That will be Used for Excavating Harbors in Hudson Bay, in Connection with Short Route from Canadian Northwest to Europe

As a part of the plan for establishing a short route through Hudson Bay from the Canadian Northwest to Europe, harbors for seagoing vessels are to be built at Port Nelson, the Hudson Bay terminus of the Port Nelson Railway, and at a point on the south shore of James Bay. For digging these harbors one of the largest suction dredges ever built in Canada has been completed at Toronto, and it is planned to tow this vessel down the St. Lawrence River, along the coast of Labrador, and into Hudson Bay during the coming season. Hudson Strait and the northern waters of Hudson Bay are icebound during the greater part of the year, but so positive are the Canadian authorities that this route can be kept open during the season when the heavy grain shipments take place, that construction work is to be carried forward vigorously. Enormous ice-breaking vessels will be used for maintaining a channel through the ice, and it is believed that there will be no serious danger from icebergs during the season when the route is in operation.

The dredge, to be used in building the harbors, is 180 ft. long, has a beam of 43 ft., and weighs 1,200 tons.

On account of the isolated location of the work, the dredge is provided with a complete machine shop, which is equipped with lathes, planers, drills, and all other tools needed in making repairs. Both sides of the main deck, at the front of the engine room, are divided into cabins for the officers and crew. The vessel has a coal-storage capacity of 250 tons, and will carry a fresh-water tank of 80 tons capacity. It is expected that a crew of about 35 men will be carried.

AUTOMOBILE HEATER USES ENGINE EXHAUST

A new type of automobile heater, which uses the exhaust gases from the engine, consists of a strong, light aluminum casing, 26 in. long, 10 in. wide and 1½ in. thick, through which the burned gases pass. This heater is laid flush with the floor, the edge of the floor being lined with an asbestos-fiber cement as a protection from the heat. The quantity of heat entering the heater is regulated by a valve.

A MOUNTAIN OF PRECIOUS MINERALS

A mountain, 1,000 ft. high and two square miles in area, devoid of all vegetation except cactus and agave and believed to be one of the most highly mineralized masses of rock in existence, stands near the headwaters of the Gila River in New Mexico. It is called Alum Mountain and is owned by one man. One of the minerals which forms a large proportion of its billions of tons of rock is so rich in aluminum that it is expected to afford an inexhaustible supply after the bauxite deposits of the East are used up. The peak is of volcanic origin and it is thought that almost pure aluminum, as well as large deposits of gold, will ultimately be found in it. Beautiful imitation rubies, emeralds, topazes and diamonds have been made from its minerals. It is also expected to prove a valuable source of sulphuric acid, which is in great demand as a reducer of phosphate rock for fertilizers.

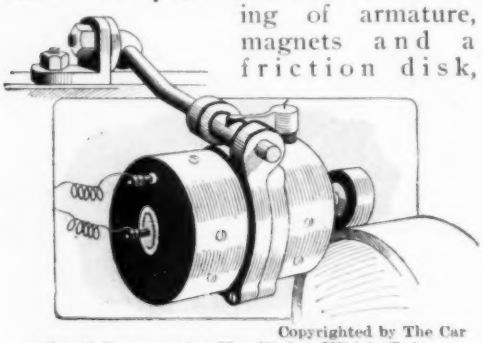
VACUUM MILK CANS MAKE SHIPPING SAFE

That heat and cold cannot penetrate a vacuum is the principle upon which a patented shipping can for dairy farmers is constructed. Heavy metal containers, built double — simply a can within a can — are connected at the neck, the air being exhausted from between them. Milk placed in the can at 38 deg. F., so the manufacturers claim, will at the end of 24 hours be not above 50 deg. F., no matter how high the thermometer goes. Likewise, if milk is placed in the can at 60 deg. F., it will not freeze for 24 hours, thus giving the milk producer protection both from winter's cold and summer's heat, which is, obviously, a great advantage.

Alum Mountain, New Mexico; Rich in Aluminum and Thought to be Almost a Solid Mass of Valuable Minerals

SIMPLE LIGHTING DYNAMO FOR AUTOMOBILES

A simple lighting set for illuminating the headlight of an auto is provided for in the system illustrated, consisting of armature, magnets and a friction disk,



Copyrighted by The Car
Small Dynamo for Headlights Which Takes Its Power from the Flywheel

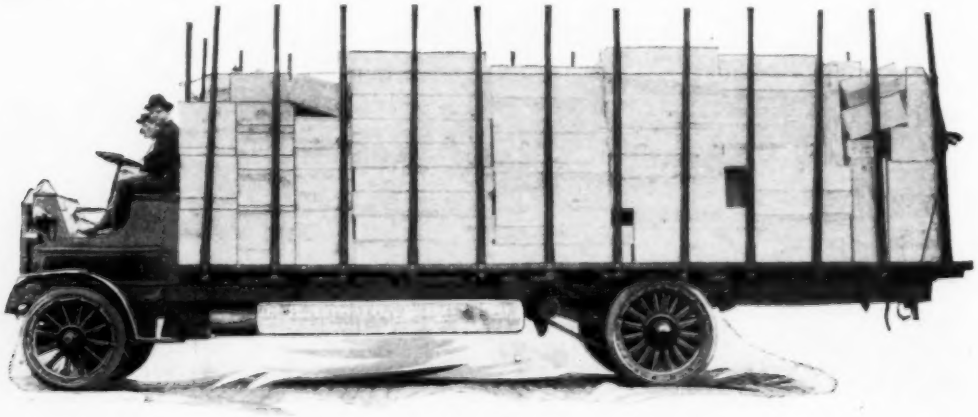
which a spring forces against the periphery of the flywheel. The headlights can only be used when the engine is in action, and oil or other illuminants must be used to comply with the law when the car is not running. No battery is carried in which current can be stored for employment when the motor happens to be stationary. When the headlights are no longer required, the friction disk is withdrawn from the edge of the flywheel, an operation under the control of the driver.

TELEPHONE POSTAL CARD BEING CONSIDERED

The postmaster-general is considering the adoption of a new form of post card, which will show not only the ordinary street address of the recipient but his telephone number also. Upon its arrival at destination, a clerk would immediately call up the telephone number and ask for the person to whom the card is addressed and read the message, after which the card would be delivered in the usual way. The card would bear a special stamp, costing five cents, and would have preference over other first-class mail matter in the same manner the special-delivery letters do now. A reply postal card would be 10 cents. The number of words might be limited, and no liability assumed by the postal authorities other than that now borne in the special-delivery letter.

MOTOR TRUCK OF UNUSUAL SIZE

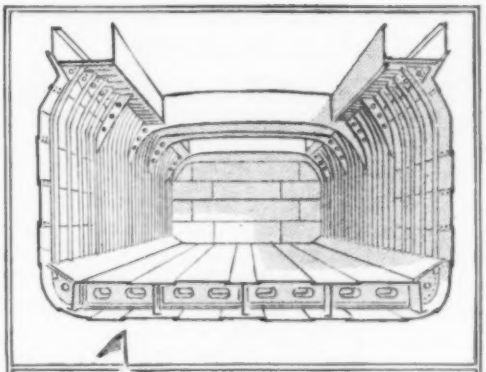
A motor truck that is almost as large as a railroad box car, and which is said to be the largest in the world, has recently been put into delivery service in Chicago. This truck is 29 ft. 5 in. long over all and has a wheel base of 17 ft. 4 in., but in spite of its size it is so controlled as to be readily handled on crowded city streets. An automatic controlling mechanism limits the speed to 12 miles an hour.



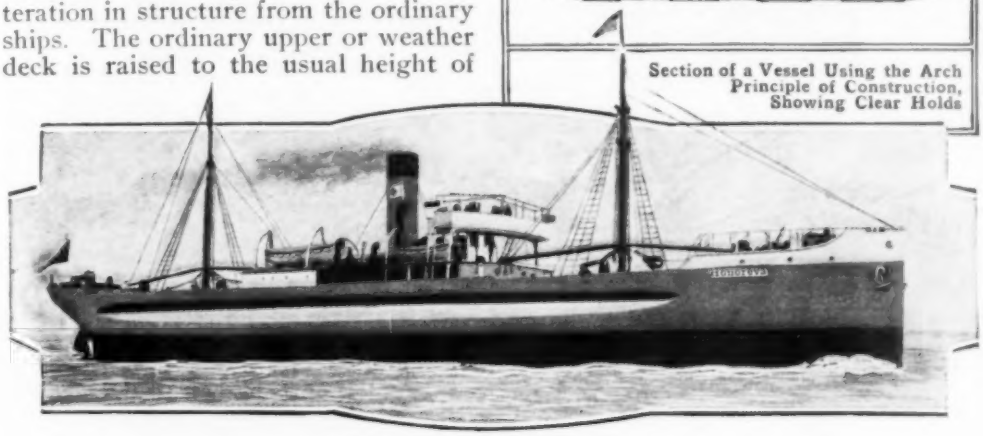
Motor Truck That is Said to be Largest in the World

ARCH PRINCIPLE OF SHIP CONSTRUCTION

Ships are being built under an English patent in which the principle of arch construction is employed. The arch system is an innovation in the form of the upper structure and consists of strengthened girder frames at regular intervals reinforcing the intermediate usual framing. Below the normal molded depth there is no alteration in structure from the ordinary ships. The ordinary upper or weather deck is raised to the usual height of a deck bridge by means of the transverse-arch construction, making a continuous deck fore and aft. This transverse arch does away with the necessity of pillars, yet supports both the deck and the vertical side of the vessel. The adoption of this system is claimed to give a saving in cost of construction, and an increase in carrying capacity over a ship of similar dimensions built along ordinary lines. The holds are deeper and clear of supports and the cargo is more easily loaded and unloaded. A number of vessels built under this system are now engaged in ocean trade, carrying coal, timber, grain, and the like, showing great adaptability in handling economically various cargoes.



Section of a Vessel Using the Arch Principle of Construction, Showing Clear Holds



One of the Arch-System Vessels Afloat

¶ Last year the government gave away more than 120,000,000 ft. of timber to settlers and miners living in or near the national forests.

INJURY TO HAT PREVENTED BY HATPIN GUIDE

A French novelty designed to prevent the disfiguring of hats with numerous pin holes consists of a button-like guide to be attached to the hat, and through which the hatpin is inserted. It is made of crystal or colored stone and may be secured in colors to harmonize with the hat trimmings. By means of a spiral wire, the guide is quickly attached to the hat, or removed, after the manner of a screw button. A fine wire leaving only an inconspicuous mark is used, so that the guide causes little damage to the hat.

RADIUM SETS NEW STANDARD OF VALUES

A speck of radium weighing 35 milligrams, and incased in a lead container 1 in. long and less than ⅛ in. in diameter, was lost recently in a Chicago hospital, where it was being used in treating a cancer case. The value of this bit of rare metal was $4,500. The same weight in blue-white perfect diamonds would only be $30 at current prices. This serves to give a concrete idea of the value of the most precious metal in the world.

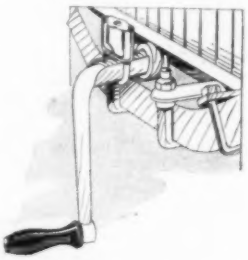
STAPLES ARE DRIVEN INTO NEW CONCRETE POSTS

Concrete fence posts into which wire staples can be driven are now being manufactured in large quantities. In shape and method of reinforcement they are very much like other cement posts, but the means provided for securing the fence wires is unusual and practical. Down the side of each post is a narrow channel filled with a composition into which nails and staples can be driven as easily as into wood. And when the staples have been set, they cannot be drawn out. The posts are built in various sizes for different uses and are practically indestructible. The composition of the material into which the staples are driven is secret.

Fence Made of Concrete Posts into Which Iron Staples can be Driven

PADLOCK FOR AUTOMOBILE STARTING CRANK

Small automobiles which do not have self-starters can be protected against thieves by a lock for the starting crank which has recently appeared. It is a heavy padlock with a long shank which fits around the stem of the crank and makes it impossible to press the crank into engagement with the engine shaft in order to start the motor. The key fits in the lock either side up and can be turned in either direction to open the lock, so that fumbling in the dark is avoided.



NEW GAS ENGINE HAS TWO PISTON HEADS

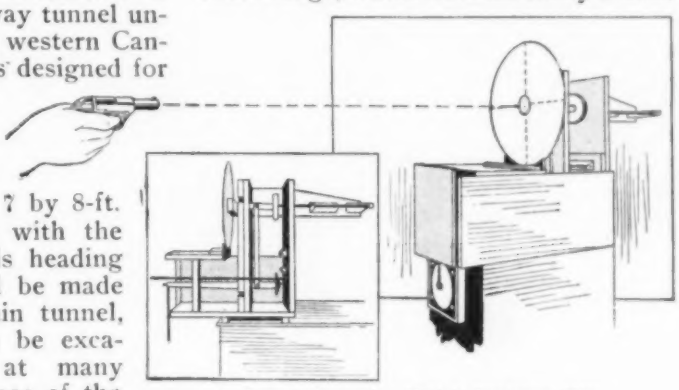
An internal-combustion engine has been brought out in which the essential feature is two piston heads that are forced apart by the explosion of the charge in the space between them, both piston heads being directly connected with the same shaft. Engines operating on this principle are not new, but heretofore have been built with a complicated and indirect connection between the upper piston head and the shaft. This difficulty is overcome in the new engine by passing the rod from the upper piston head through an opening in the lower piston head to a direct connection with the shaft, the rod being carefully packed to prevent leakage. The two crank arms are placed as close together as possible and the upper part of the cylinder has an offset so that the upper rod will clear the lower.

NOVEL PLAN FOR BUILDING RAILWAY TUNNEL

Driving one tunnel to furnish access to the workings in another is the novel means adopted by the contractors in building a five-mile railway tunnel under the Selkirk range in western Canada. The main tunnel is designed for double tracks and is to be 22 by 30 ft., while the smaller or "pioneer" tunnel, as it is called, will consist of a 7 by 8-ft. heading driven parallel with the main tunnel. From this heading numerous crosscuts will be made into the line of the main tunnel, which in this way can be excavated simultaneously at many points. The main purpose of the "pioneer" tunnel is to provide an unobstructed route for the removal of the material excavated at the different workings in the main tunnel, but it will also be of great value in supplying ventilation. Although the contractors are driving the "pioneer" tunnel at their own expense, they estimate that they will save time and money by being able to attack the main tunnel at many points.

TARGET WHICH MARKS HITS AUTOMATICALLY

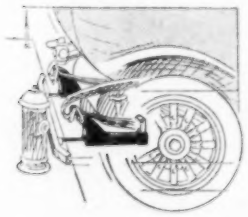
French army officers are using a new target in practice shooting at short range, which automatically marks hits by means of a balanced pointer. An arrangement of levers, capable of being adjusted for various weights of projectiles, carries an index hung in front of a false target to the exact relative position of the shot striking the true target. The index remains in position indicating the last shot until released by a pull on a string from the firing line.



A French Invention Which Registers Hits in Target Practice

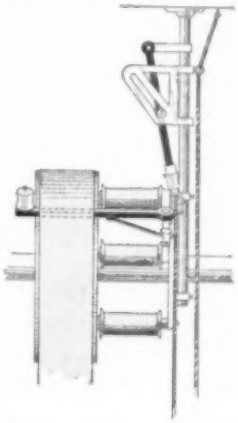
REAR BUMPERS FOR AUTOMOBILES

Many automobiles carry bumpers to protect their headlights and radiators, but the prevalence of dented tanks, marred tonneaus, and buckled springs indicates that rear-end protection has been neglected. To fill this need a bumper has been patented which can be clamped to the rear springs without disturbing the shackle bolts or drilling holes in the frame of the car. In design the bumper is similar to front-end bumpers and has coil springs to take up shocks.



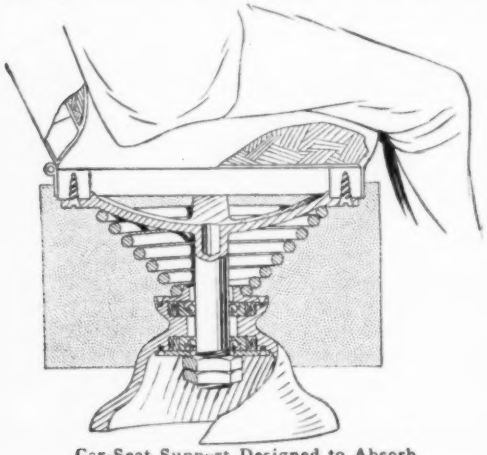
SAFETY BELT HANDLER PREVENTS ACCIDENTS

A safety belt handler designed to make impossible distressing accidents from placing belts on rapidly moving pulleys has recently been patented, in which a sliding roller, operated by a rope or lever, enables the operator to shift the pulley without moving from his machine. The device makes large reduction not only of danger in the shop but also of cost.



NEW SUPPORT FOR RAILWAY-CAR SEATS

A new form of support for railway-car seats, which has been invented and patented, is designed to do away

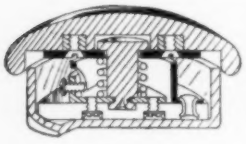


Car-Seat Support Designed to Absorb Vibration of Train

with the disagreeable vibration to which the passenger is subjected when a train is in rapid motion. This device consists simply of a volute spring, with the wide end up, on which the seat frame is supported and which rests on the pedestal, and a central tubular shaft so mounted on the pedestal as to prevent any movement sidewise. The shaft moves freely up and down in the pedestal under varying loads, and is secured in place by means of nuts on the lower end. A special arrangement of springs and ball bearings prevents the shaft from binding in the pedestal when the load is off the center of the seat.

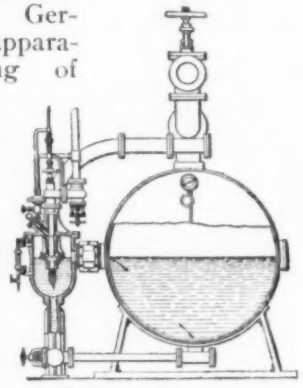
HANDY PUSH BUTTON FOR AUTO HORNS

An electric push button in which the whole top is the movable part is being manufactured for use on electric automobile horns. Pressure from any direction on the top or sides operates the button so that the chauffeur can use his elbow, as well as his fingers, to sound the horn. The push button is not quite 2 in. in diameter and can be clamped to one of the spokes of the steering wheel.



RAISE STEAM BY BURNING OIL IN WATER

A demonstration of the possibility of steam raising by the combustion of liquid fuel directly in contact with water has been made in Bremen, Germany. An apparatus consisting of a cylindrical boiler, provided with a number of pockets isolated and drained by suitable valves and drain-cocks, was used. Each



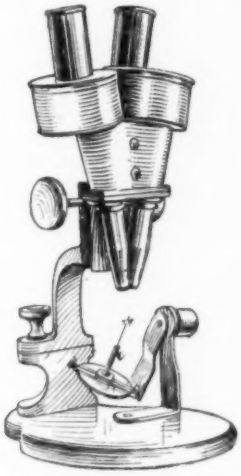
of these pockets contains an oil burner, with a pilot burner, by means of which the main burner can at starting be sufficiently heated to effect complete combustion of the oil. When the main burners are well alight, water from the boiler is permitted to flow into the previously drained pockets, and the circulation of heated water commences, the products of combustion as well as the steam generated being used as a source of power in a steam engine.

LIGHT SHOES FOR TANGO DANCERS

Tango dancing has created a demand for special shoes, and ballet slippers, hand-sewed and hand-turned of light leather, are now on the market. The shoes have soft soles of oak-tanned leather, without heels and with soft toes. They are light as a feather, and were formerly sold to the theatrical trade exclusively. Now, however, their vogue extends to high-class retailers.

INSECT MICROSCOPE FOR NATURALISTS

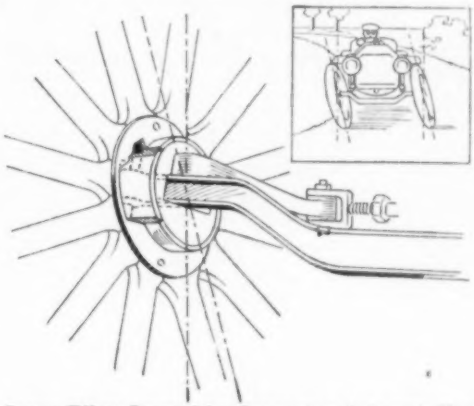
The insectoscope is the name applied to a binocular microscope recently brought out in France to aid in the study of insects. Its purpose is to combine the high magnifying power of a microscope with a mechanism that will enable the naturalist to study the insect from all sides. The lenses magnify 80 diameters and the double vision made possible by the binocular arrangement puts surface objects into relief. The interesting part of the insectoscope is its apparatus for holding the insect. An ingenious arrangement of pivoted arms makes it possible to rotate the holder in three directions so that it can describe a complete sphere with the insect always at the center under the lenses. The insect can thus be studied systematically from every possible point of view.



CARS THAT RUN IN STRAIGHT LINE WITHOUT STEERING

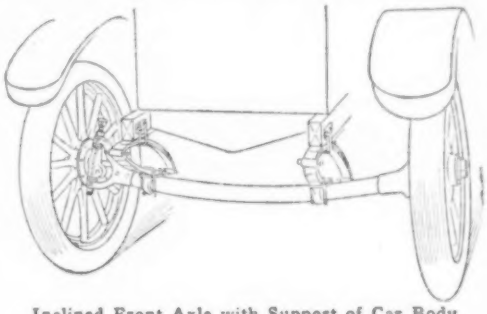
A new feature in automobile construction, that is expected to add greatly to comfort and convenience in driving, is an arrangement of the front axle that causes the front wheels to straighten out automatically with reference to the car body after the car has turned a corner. At least one of the 1914 models has this feature, while patents are being taken out for a different mechanism designed to accomplish the same result.

In the ordinary type of car the axis of the knuckle joint on which the front wheel is turned in steering is vertical, while in the new car the axis of this joint is inclined so that the lower end of the joint is ahead of the upper end.



Caster Effect Secured by Connecting Axle with Hub at Point Ahead of Wheel Center. Position of Wheels as Car Makes Turn Shown at Top

The entire axle is built on this angle and, owing to the drop in the middle of the fixed axle, the supports of the front end of the car body are an inch, or more, ahead of the wheel centers. The spring supporting the body is also inclined at this angle, the front end being several inches higher than the rear end, and as a result of this, the weight of the car acts as a thrust forward on the axle. This thrust combined with the fact that the supports of the car are ahead of the wheel centers causes the wheels, when freed from the control of the steering column, to trail into position at right angle to the fixed axle, for exactly the same reason that a caster trails into line when an article of furniture is being moved. With the knuckle joint inclined in the way described, the wheels lean inward



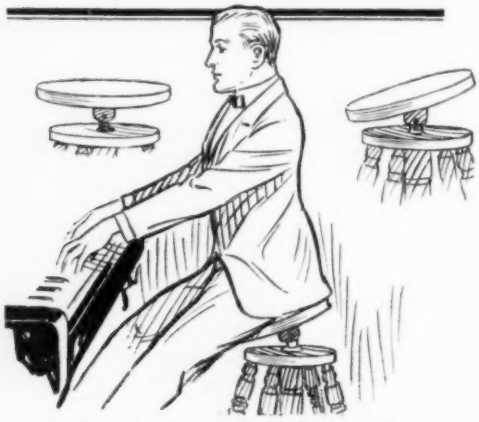
Inclined Front Axle with Support of Car Body Placed Ahead of Wheel Centers

toward the center of the curve when the car is rounding a corner.

In the other mechanism, which is not yet on the market, but has been subjected to the test of practical operation on the inventor's car, an inclined joint and axle are used, with an additional feature designed to make the caster action more positive. The wheel hub is sleeved over an inner stationary hub on which it revolves, ball or roller bearings being used between the two hubs. The axle is attached to this inner hub by means of a knuckle joint that is inclosed in the inner hub and has its axis in the plane of the wheel spokes, an arrangement designed to do away with practically all the bending strain on the joint. This joint is placed at a point slightly ahead of the wheel center, and it is claimed that this, combined with the inclined joint and mounting, produce so strong a caster action that the car will run in a straight line over the roughest roads without any control from the steering column. As in the other car, the wheels lean toward the center of the curve when the car is making a turn.

TILTING PIANO STOOL NOW HELPS PLAYERS

An adjustable piano stool, the head of which may be tilted to any desired angle, is announced by a manufacturer who believes he has solved the problem presented by customers who demand both piano bench and stool, as this new arrangement permits the freedom of the piano bench with the added feature of adjustable height, an advantage heretofore enjoyed only in the revolving stool. The new stool is furnished with rubber tips on the brass crow feet instead of glass balls, insuring that the stool will not slip even on the smoothest floors, no matter how vigorously the performer uses the pedals.



Piano Stool on a Tilting Head Makes Pedaling Easier

PORTABLE TELEPHONE SET FOR SECTION GANGS

A portable telephone outfit has been designed especially for the timekeepers of section gangs at work on railroads which use telephones for train dispatching. By the use of the portable outfit the timekeeper can keep posted on all train movements either by asking the dispatcher where a given train is, or simply by listening to the orders that are going over the wire.

When trains are running late, or extras are frequent, it is common for a rail or ballast gang to hold up trains until the track can be closed or a run-off finished. By means of the telephone set, such delays can be avoided.

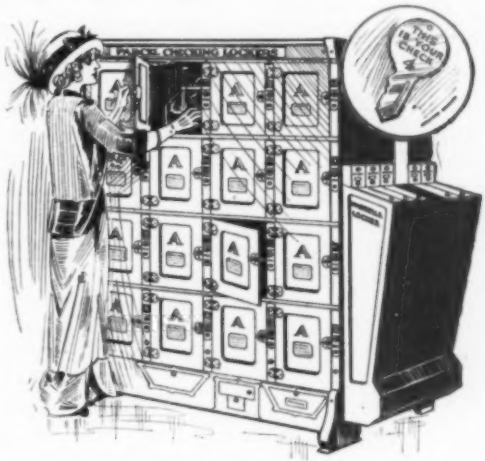
The type of portable outfit used on the Chicago and Northwestern system is here shown. The box contains the complete mechanism, and the jointed pole for making the line connection is the only other equipment required. A line wire, about 150 ft. long, is supplied, so that the timekeeper or foreman can arrange the connection at the most convenient point.

"BRUSHING" COLD CREAM INTO THE SKIN

Modern methods in beauty culture demand new utensils for the war against age. A sanitary improvement for applying cold cream to the face and neck is shown, whereby the cream is held in a tube in the handle of the brush. By pressing the collapsible tube the cream is forced out as needed and applied to the skin by the brush. When the cream is almost used up, a key may be placed upon the bottom of the tube and the tube rolled up until the cream is all forced out.

PARCEL-CHECKING CABINET REQUIRES NO ATTENDANT

An automatic, coin-controlled locker, recently patented, is being placed in railway stations and similar places for the convenience of travelers and shoppers. Each locker is large enough to hold two large suitcases, and the doors are normally not locked. To check baggage or bundles, the door is opened, and articles placed within the locker, and the door swung shut. By placing a coin in the slot the key may be turned, locking the door, and the key is then withdrawn and carried as a check, giving access to the locker when articles are again required. Unlocking and opening the door, automatically locks the key in the lock once more, from which it cannot be withdrawn without depositing another coin. Umbrella lockers are attached, providing suitable receptacles also for golf clubs, fish poles and guns.



Pressed-Steel Cabinet for Checking Baggage, with Umbrella Lockers Attached

GARBAGE CAN WHICH IS ALWAYS CLOSED

A garbage can with a cover that can be opened by a simple pressure of the foot has recently been patented. When the can is standing upon the ground its handle falls over the front and forms a lever that automatically raises the lid when the toe is pressed upon it. Its advantage is in the fact that the lid is always closed. The device is being marketed in several forms for garbage, waste, or oily refuse.

This Garbage Can is Opened with the Foot

NOVEL AND PRACTICAL THINGS FOR DAILY USE

Individual windshields for motorists are among the latest novelties in the way of automobile accessories. The shield is held in position a few inches in front of the wearer by a simple attachment which hooks over the shoulders and rests on the chest, so that the whole device, unlike a fixed windshield, moves with the wearer.

Individual Windshields for Protection of Passengers

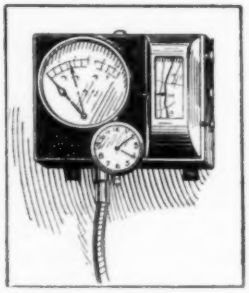
A new type of shoe, recently brought out, is designed to be worn in skating or while engaged in other sports in which a firm support of the ankle is essential. The ankle rests in an inner canvas leg and is held firmly against the back of the shoe by means of the strap passing through to the buckle outside of the outer shoe.

Shoe Designed for Skating or Other Sports for Firm Support of Ankle

An electric signal for answering the night bell has been installed in clubs and small hotels in England. The signal consists of the word "Coming" painted in white letters on a red glass disk, behind which is an electric-light bulb controlled by a switch in the night porter's bedroom. When the bell rings the porter switches on the light.

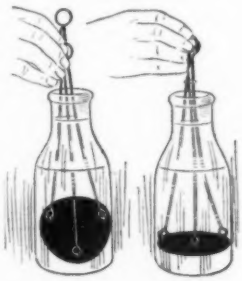
Electric Signal for Use in Answering Night Bell

A new route and speed indicator for automobiles combines in one case a speed indicator, road map and watch. The road map, which works in conjunction with the speed indicator, automatically indicates the exact position of the car on the road at any time. This device is apparently of particular value for driving at night or in time of fog.



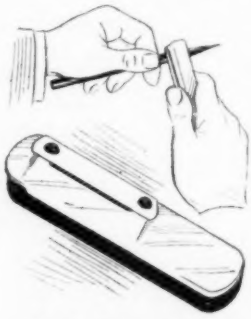
Automobile Indicator That Shows Time, Speed and Position on Road

A new device for lifting the cream from a bottle of milk consists simply of a flexible rubber disk to which three aluminum-wire handles are attached. These are so arranged that the disk can be dropped down edgewise through the cream and then be brought up flat in such a way as to lift the cream from the top of the milk.



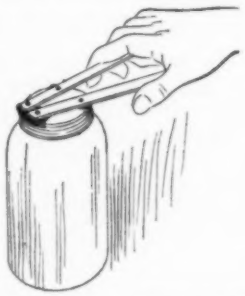
Flexible Rubber Disk Provides an Easy Means of Lifting Cream from Milk

A handy novelty recently brought out is a pencil sharpener, adjustable to light or heavy cuts and worked after the manner of a safety razor. The blade is of razor steel and may be removed and sharpened in the same way as a razor blade. The case that carries the blade has a receptacle in which all chips and shavings are deposited automatically.



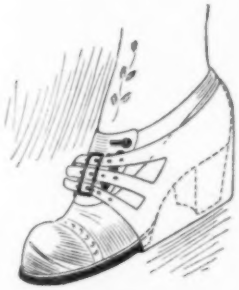
Pencil Sharpener That Works Like a Safety Razor

A recently invented kitchen utensil is a wrench designed to be used in tightening and loosening the screw lids of fruit jars. This wrench is provided with clamps which fit closely over the rim and these take a firm grip on the lid when the handles of the wrench are drawn together, and the top is easily removed.



Wrench for Tightening and Loosening the Screw Lids of Fruit Jars

Rubber overshoes having a decidedly novel purpose, since they are designed to protect the ground instead of the shoes of the wearer, have been introduced in England. This type of overshoe consists of a rubber covering which fits over the heel and comes forward to the ball of the foot, the idea being to protect croquet grounds or tennis courts from damage by high and narrow heels.



Rubber Overshoe That Protects Ground from Shoe of Wearer

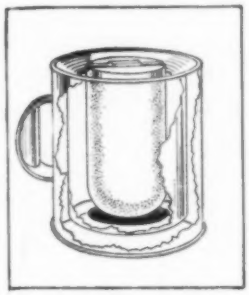
Wherever washing or dyeing is done some sort of a stick is commonly used for lifting the clothes from the boiler or kettle. A laundry utensil, recently placed on the market, is a clothes stick provided with two prongs, a feature that apparently adds greatly to the effectiveness of this simple tool. The prongs are of metal coated with rust-proof enamel.

New Form of Clothes Stick Having Pronged End

A new form of hoe, which is practically a hoe and hand plow combined, is intended as a universal instrument for gardening, for trimming sidewalks and fences, and for cleaning out around shrubbery. This implement is so shaped that it can be used for almost all the operations in connection with gardening, such as hoeing and bedding, furrowing, covering seed, and weeding.

Hoe Adapted to Variety of Uses in Gardening and Caring for Lawn

Much of the labor of freezing ice cream is eliminated by a new freezer that requires no turning. It is claimed that this freezer will freeze ice cream in 15 minutes and with no attention other than that of placing the cream and brine in the proper receptacles. The outer wall consists of a vacuum chamber, so that practically all the heat absorbed by the brine is taken from the cream in the central chamber.



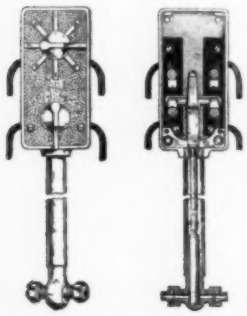
Ice-Cream Freezer with Which No Turning is Required

A recently invented implement, shaped like a pair of tongs, is designed for protecting the hands and for overcoming much of the drudgery of kitchen work. It can be used efficiently for scraping and cleaning, lifting and holding meats and vegetables, and as a holder for the dish towel in washing dishes.

A Handy Tool Designed for Kitchen Use

AUTOMOBILE LOCK GIVES COMPLETE SECURITY

The theft of an automobile, which according to the daily papers is no uncommon crime, may be prevented in many cases by the adoption of a device recently patented, which cuts off the gasoline between the tank and the carburetor. This novel lock has no key, being operated by an easily set and readily changed combination, and not only cuts off the fuel, but at the same time breaks the ignition. When leaving the car the driver simply turns a spiked wheel on the dashboard. It will be impossible to start the car until the handle is adjusted to the prearranged numbers. The lock is capable of hundreds of combinations, and is as readily locked and unlocked in the dark by one who knows the combination as if operated with a key.

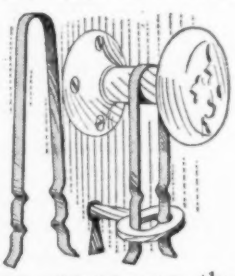


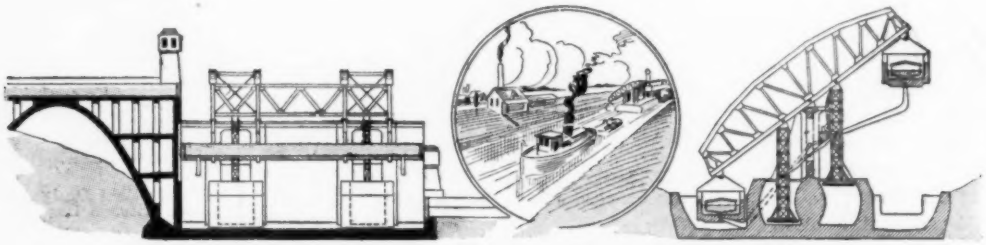
BALANCED CANAL LOCKS LIFT BOATS HIGH

A mechanical lift has been planned for the Berlin-Stettin Canal at Niederfinow, which will take canal boats directly from high to low level, or vice versa, a distance of 118 ft., making it, when completed, the highest vertical ship lift in the world. The structure, as planned, consists of two beams of bridge construction joined together and pivoted along a transverse line on a central pier. At either end is swung a trough, 223 ft. in length, into which the vessel to be lifted enters. The lifting is accomplished by four steel-skeleton towers pivotally attached to the beams at their upper ends and built upon platforms which move in water-filled wells. The motive power is furnished by two 100-hp. electric motors, each capable of moving the loaded lift alone. Guide arms hold the troughs steady while being lifted and the platforms on which the lifting towers stand are so fitted to the wells, that little side play is allowed. The boats plying this canal are of about 660 tons burden, and the troughs are ample to accommodate them. When fully loaded, the troughs weigh approximately 2,300 tons, including the necessary water. The lift will handle one trough only or both with equal ease.

A SIMPLE LOCK FOR DOOR KEY

A recently invented device for locking a door key in the lock so that it will be proof against the burglar's nippers used to turn a key from the outside consists simply of a heavy metal ribbon shaped like a hairpin and having two bends or curves near the end of each prong. This device is set astride the stem of the door knob and the prongs are inserted in the loop of the key.

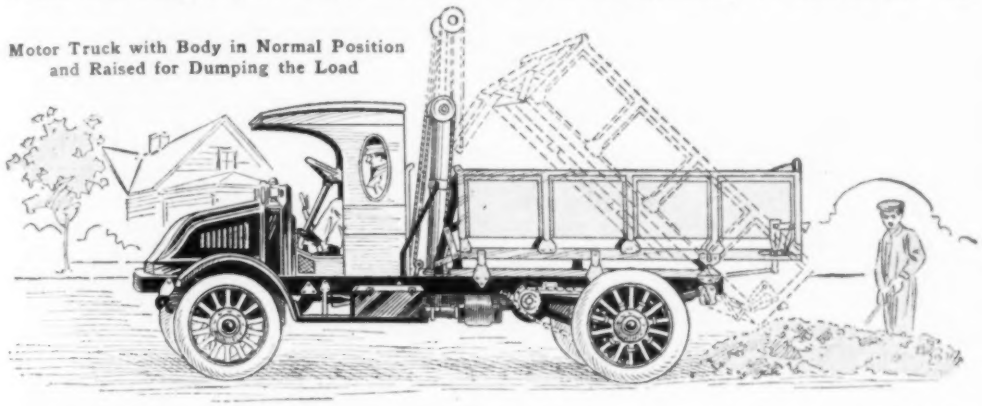




New Canal Lock of Great Lifting Power, Showing Towers and Wells, and How Trough is Raised to High Level

HYDRAULIC APPARATUS FOR DUMPING MOTOR TRUCK

One of the new features in motor trucks is a dumping body operated by



Motor Truck with Body in Normal Position and Raised for Dumping the Load

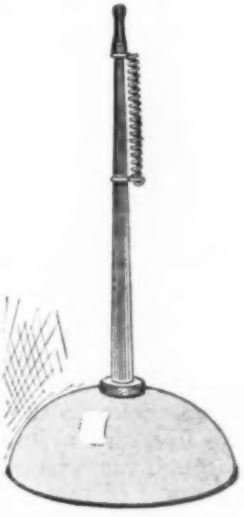
an oil-driven hydraulic apparatus. The apparatus consists of a steel cylinder, 6 in. in diameter, standing upright on the frame of the car, as shown, and containing an ordinary piston with piston rod passing out through the top casing. At the upper end of the piston rod are two pulleys over which run the wire ropes used in hoisting the end of the body. The back end of each of the wire ropes is fastened to the lifting nose of the steel body, and the other end is fastened to a stationary equalizer, which insures equal tension in the two ropes. Oil is forced into the cylinder, driving the piston up or down as required, by means of a gear pump fastened to the cylinder base. The steel body is pivoted near the rear end and the front end is raised and lowered by means of this apparatus. A 3-ton load can be lifted and the body brought back to its seat in about one minute.

REWARD FOR RECOVERY OF SHIP'S ANCHOR

A reward of $250 has been offered by the United States Navy Department for the recovery of an anchor and chain lost from the battleship "Rhode Island" last August. The anchor and chain, which together are valued at about $1,000, were lost off Block Island in about 108 ft. of water. Bearings of the ship's position were taken at the time, but in spite of this it will be necessary to search the sea bottom over a radius of about half a mile. One man has offered to hunt for the equipment for $200 a day and to keep up the search until it is found.

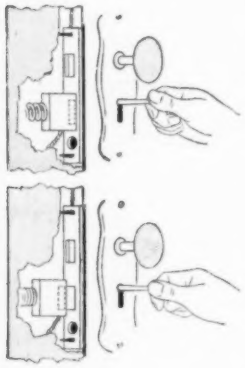
SPRING TO HOLD OILCAN CAP IN PLACE

An oilcan cap that never gets lost is shown in this drawing. It is fastened permanently to the tube of the can by a small coil spring. When the can is not in use the spring holds the cap on tightly, to keep out dust and water, and when the can is being used the spring draws the cap back out of the way. The wire rings which hold the spring in place are soldered to the tube and the cap. Such an arrangement is especially useful on a can of gasoline used for priming.



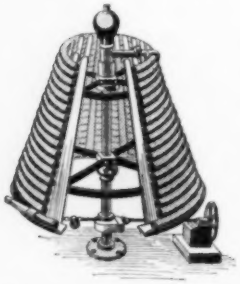
DOOR KEY TURNS LIGHTS ON AND OFF

A recently invented lighting device is so designed that when the key is inserted and the door is locked from the outside the electric lights in the room or suite of rooms are automatically turned off, while the reverse operation of unlocking the door automatically turns them on. Locking or unlocking the door from the inside does not affect the lights in any way, while the device may be entirely disconnected from the lighting system by means of an ordinary switch. This system is intended principally for hotel rooms, but is suited for installation in other buildings as well.



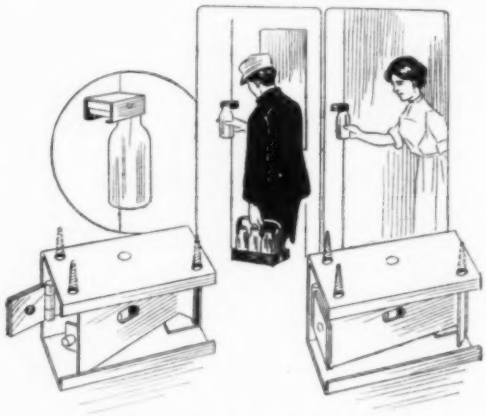
HOSE REEL AND STANDPIPE COMBINED

Quick action at fires is secured by a new hose reel mounted on a standpipe to which the hose is always attached ready for instant use. Its central pivot, as it is patented, is a water pipe with an air chamber at the top and fittings to be attached permanently to one end of the hose. One man can get the hose into action. He opens the water valve, picks up the nozzle and runs to the fire, and a full stream is running through the hose while it unwinds, the pressure of the water assisting in the unwinding. The hose drains itself as it is coiled back on the reel and is always dry and free from kinks.



MILK-BOTTLE PROTECTOR STOPS PETTY THIEVING

It is more than a suspicion that some people endeavor to reduce the high cost of living by taking bottles of milk from door steps of late risers. To discourage this form of thrift a device has been invented which automatically locks the bottle in such a manner that it can only be removed by the occupants of the house upon opening the door. The contrivance is fastened to the door jamb with screws. When the milkman makes his delivery in the morning, he slips the bottle under two projecting flanges. As the bottle is pushed further in, it comes in contact with a pivoted plate, the outer end of which is bent downward and, when released by the bottle striking the other end, drops, effectively locking the bottle in place. The locking device can only be released by opening the house door.



Prevents Loss of Milk after Delivery

MAKING FILM PICTURES OF FLYING BULLET

An apparatus capable of making film pictures at the rate of 100,000 a second has been invented, and with it some remarkable pictures have been made. In one case 72 consecutive views of a bullet fired from a revolver were taken while the bullet was passing through a space of 10 in. This bullet was fired

through a thin piece of wood, and the film showed a curious situation. The wood did not show any effect from the impact of the bullet until the bullet had passed completely through it. Then splinters began to form, the stick split, and finally fell to pieces. No camera shutters can be used with this apparatus. A series of electric sparks are flashed at the rate of 100,000 a second and a picture is made with each flash. The film is carried on a wheel 3 ft. in diameter that makes 9,000 revolutions a minute.

WHAT THE GRADE-CROSSING PROBLEM MEANS

The accompanying bulletin relating to the question of safety at railroad grade crossings has been posted in all stations of the Pennsylvania Railroad.

Safety At Railroad Grade Crossings

"The railroads are only too happy to remove all grade crossings, to equip every mile of track with automatic block signals, to make every car of all steel construction, but to do these things is utterly impossible without the money with which to pay for them."

—From Letter by W. Sproat Rea, President of the Pennsylvania Railroad Company, to Philadelphia Public Ledger.

What the Pennsylvania Railroad System Has Done

There remain on the 11,000 miles of line comprising the Pennsylvania System 13,027 crossings at grade. It costs an average of at least $50,000 to remove a grade crossing. Thus, to eliminate every such crossing on the lines of this System would cost upwards of $600,000,000. The various Companies of this System have since 1902 expended $66,641,294 in improvements resulting in the elimination of 1052 grade crossings.

An Appeal to the Public

Grade Crossings are unavoidable. Without them, few railroads could have been built in this country. They are one of the inconveniences of progress, to be eliminated just as fast as possible. Railroad officers are doing their best, but it all takes time and money.

Meanwhile, the public demands that trains be run on time. To do so involves speed over crossings. The Railroad appeals to the driver of every vehicle and every pedestrian before crossing a railroad track to "STOP, LOOK, LISTEN." A little care and a momentary stop may mean the saving of a human life.

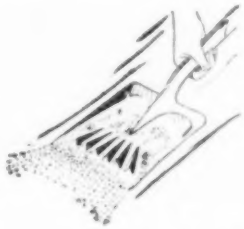
Human lives are the most precious things in the world.

Bulletin No. 2

Conditions on other lines are probably not much different from those given, although the average cost for eliminating a grade crossing is doubtless somewhat lower on the less important single-track railroads. This bulletin indicates what an enormous undertaking the railroads will have to face in complying with the public demand for the removal of all grade crossings.

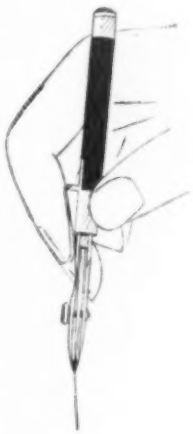
NEW SHOVEL SPREADS COAL OVER FIRE

A shovel provided with ribs placed as shown in the illustration and designed for separating small coal or cloggy coal dust and spreading it in a thin sheet over the fire, is a recent invention intended particularly for use in firing boilers where a cheap grade of coal is used. It is claimed that this type of shovel will overcome one of the greatest difficulties in furnace firing, that of cooling the fire and obstructing the draft by too thick a layer of coal.



FOUNTAIN DRAWING PEN FOR DRAFTSMEN

A fountain drawing pen, which has recently been patented and placed on the market, seems to have overcome the difficulty of using heavy drawing ink in a fountain pen. The ink reservoir is a rubber tube in the handle of the pen, and ink is fed to the pen in any quantity by a slight pressure of the finger on a lever on the side of the pen. The lever compresses the soft rubber reservoir so as to force the ink into the pen point.



SELECTION OF COLORS FOR INTERIOR DECORATION

The use of colors in interior decoration ceases to be a matter of taste and can almost be reduced to rules when the relations which various colors bear

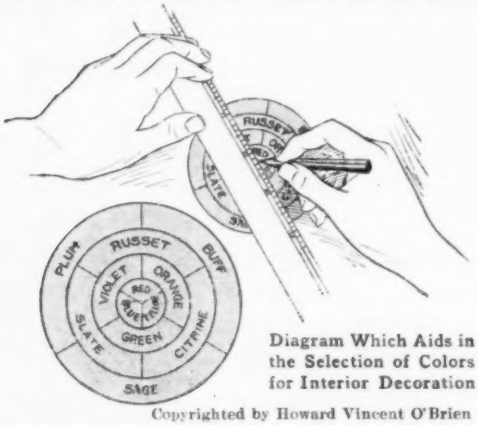


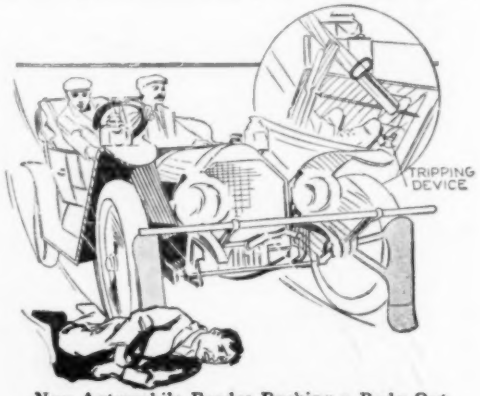
Diagram Which Aids in the Selection of Colors for Interior Decoration

Copyrighted by Howard Vincent O'Brien

to each other are considered. There are certain fundamental colors which are too strikingly different to go well with one another, and by a mixing of these primary colors are made combination colors that are related to each other just as are the fundamental colors of which they are made. This relationship is illustrated by the accompanying diagram. The smallest circle contains the three primary colors; the next circle gives the three possible combinations of the primary colors, and so on, to the fifth circle. From the diagram it is possible to see what combination of colors is contained in each color outside the primary circle, and it is also possible to determine from this relationship what combination of colors will go well together. If a straight line is drawn in any direction from the center of the diagram to the circumference, the four colors that it intersects can safely be used together in interior decoration. For example, if a prevalent sage color is desired, a line from one end of the sage section to the center shows that slate, green, and blue can be used with it; or a line from another point indicates that citrine, green, and yellow will make a safe combination. Complementary colors can be determined in the same way. As blue and yellow are complementary of red, their combination, green, can be used with red; and sage can be used as a complement of russet. When the prevalent color for a room has been selected, the rule of color combinations will supply the other possibilities.

AUTOMOBILE FENDER OF NEW DESIGN

One of the many automobile fenders designed to throw a pedestrian out of the way and keep the wheels from passing over his body consists of guards over the front wheels, as shown in the accompanying picture. This device, which is patented, is not cumbersome or unsightly when out of use, but is arranged to drop into position automatically when a pedestrian is struck. A sheet-steel guard, a little wider than a tire and ending at the lower end in thick leather, backed by a flat spring, hangs over each front wheel, pivoted on the steering knuckle. Ordinarily the guards are elevated almost to the mudguards but when a pedestrian comes in contact with a brass bar that stretches across the front of the car, the guards drop down to within ½ in. of the pavement ready to push his body



New Automobile Fender Pushing a Body Out of the Way of the Wheels

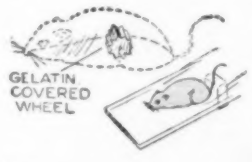
out of the way of the wheels. A button at the driver's feet enables him to drop the fenders before the pedestrian is struck and a handle on the steering column draws them back to their upper position.

ELECTRIC OVEN RESTORES BABYLONIAN BRICKS

A collection of bricks from ancient Babylon in the library of the University of Strassburg, Germany, was threatened with loss from disintegration, as some of the bricks had been only sun-baked and were badly deteriorating, so that little hope remained of preserving or translating the cuneiform inscriptions with which they were covered. It was suggested that the unfinished baking be completed in the electric oven of the chemistry department, and this experiment succeeded so well that the ancient bricks, rejuvenated by a modern process, will have as lasting qualities as the rest of the collection. Not only were the tablets protected from disintegration, but foreign matter which had made translation difficult, was burned away and the characters are now easily read.

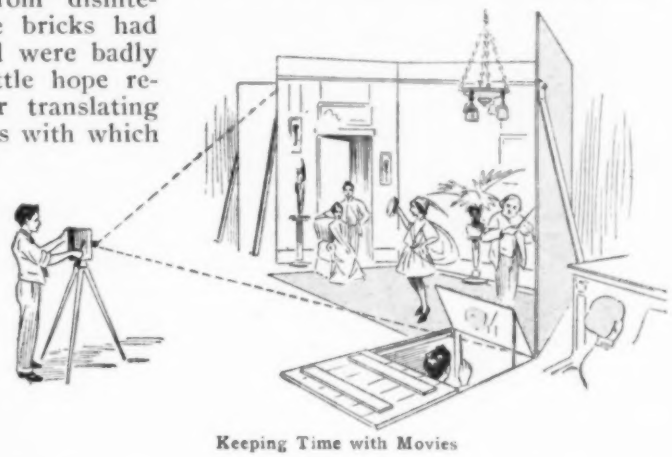
FRENCH TOY HAS VAGARIES OF REAL MOUSE

A toy mouse that acts like a real mouse is a French novelty. If placed on a sharply inclined and polished surface, it will move down in an irregular path, changing its direction frequently as if impelled by a wayward fancy. This action is brought about by the peculiar construction of a small wheel, which revolves on a pin within the body of the toy and which just touches the surface on which the mouse moves. The surface of the wheel consists of teeth, like those of a gear, and these teeth are covered with gelatin. The irregular motion is due to the varying adhesion of the gelatin to the polished surface.



SYNCHRONIZING PICTURES AND ACCOMPANIMENT

Where moving pictures are designed to be accompanied by piano, band, or orchestra, it has been extremely hard to secure perfect synchronization. A German inventor has recently secured a United States patent for a device which is intended to obviate this difficulty. When a moving-picture play is being photographed, the bandmaster of the orchestra is photographed simultaneously with the play, at the side or lower edge of the film. Either the whole or a partial photograph of the leader is provided for, by means of a mirror which reflects his image as he stands in his place, and the motions of his baton or arms may be plainly seen by the performers who later play the music at the reproduction of the pictures. The movements of the bandmaster may be screened from the audience by means of walls, curtains, wings, or the like, while the actors, singers and musicians can see them.



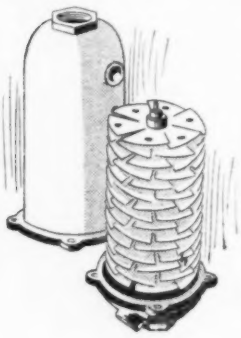
Keeping Time with Movies

NOISELESS BRAKES FOR STREET CARS

A brake shoe having a strip of asphaltum let into the surface has been adopted for use on street cars in New York recently. The new brake is said to be practically noiseless, while having good wear-resisting qualities.

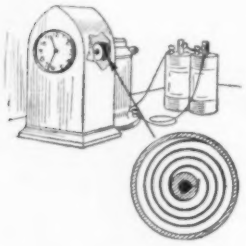
BAFFLE-PLATE SILENCER FOR GASOLINE ENGINES

A new silencer for automobile engines, made in England, consists of a series of baffle plates strung upon a rod surrounded by a cylinder to the head of which the rod is attached. The baffle plates are held in place by small bolts. In passing through this silencer, nearly all of the gas oscillates right and left between the plates and collides with a straight core of gas which passes through the round holes in the plates. The velocity of the gas is thus rapidly diminished by interference of one portion with another. The result is claimed to be absolute noiselessness without back pressure. The construction also permits easy removal for cleaning.



CLOCK WITH ELECTRICAL WINDING DEVICE

An English patent has been issued for an improvement in electric clock movements which may be attached to any household timepiece. A small induction motor, supplied from dry cells, actuates the drum containing the spring by a worm and wheel, but instead of attaching the outer end of the spring to the drum, it is left free. The spring pressing against the drum drives the clock train, and if the speed of the motor exceeds that necessary to keep the spring wound, the spring, being free, slips inside the drum on the principle of a friction clutch.

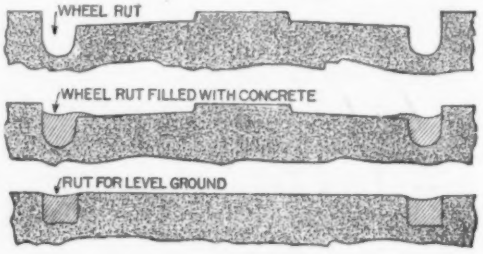


CARVER'S HANDLE FOR LEG OF MUTTON

An implement which the carver will appreciate has recently been placed on the market. It is designed to hold a leg of mutton from slipping or splashing sauce while being cut or served. The implement has a short wooden handle and two flaring tongs of metal to grasp the bone. A screw ring secures the holder firmly against the bone while in use.

NOVEL IDEA IN ROAD MAKING

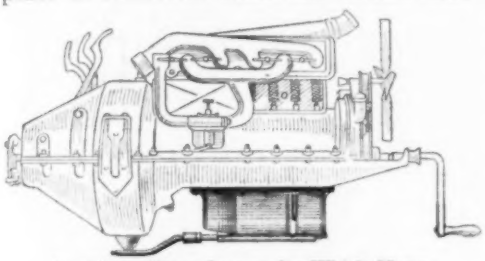
Ruts are the bane of country roads and one farmer has experimented until he has found a way to eliminate them. The idea is simply to fill the ruts of a prairie wagon road with concrete. The filling should be 4 or 5 in. thick and about 8 in. wide on top, the surface being hollowed out about 1½ in. deep for vehicle wheels, as shown in the illustration. It is easy to drive over, as the wheels follow the tracks "with first intent," and four years' wear on the experimental roads built by the originator show no wear nor corrosion. The cost is given as 10 cents per lineal foot—$528 per mile—and the roads are not only free-driving in wet weather but are almost dustless in dry condition.



Using Ruts in Road Building

AUTOMATIC OILER INCREASES LUBRICATING CAPACITY

A new automatic oiler, adapted for use where there is a demand for greater lubricating capacity, has recently been placed on the market. The bottom plate is removed from the crank case



Auxiliary Oiling System for Which Many Advantages are Claimed

of the motor and the oiler is bolted into place beneath the engine as shown. That the appliance doubles the oil capacity, allows four or five times the mileage on one filling of oil, and helps to cool the motor by rapid circulation of oil from reservoir to crank case, are some of the advantages claimed by the inventor.

ATOMIZER FOR COMBINING SEVERAL PERFUMES

A compartment perfume bottle for persons who like various scents mixed together has been brought out in Paris.

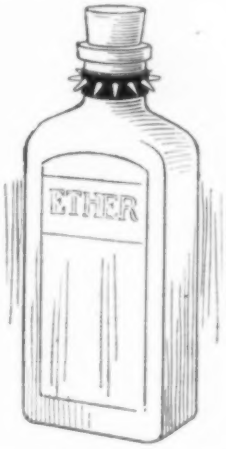
The device forms a multiple atomizer which throws out one perfume or several in combination. The bottle is divided into four compartments and each section has a separate valve and discharge pipe within the cover. The removable top of the bottle contains a small pump for compressing the air within. A different perfume is kept separately in each compartment and any combination can be secured by a plunge of the pump after the desired valves have been opened.

INGENIOUS GERMAN WRENCH

An expanding and contracting wrench of ingenious design has made its appearance on the German market. It is made of forged steel folded over several times at either end to receive the nuts. It is obvious that the more force is applied the tighter the nut will be gripped, without any danger of the wrench slipping off or wearing the edges of the nut. By exerting pressure in the opposite direction the wrench head expands, and thus the tool can be easily removed.

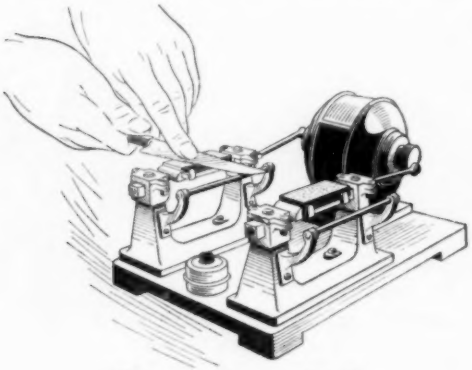
A SPIKED BAND FOR POISON BOTTLES

The safety-first campaign which is being urged on every hand finds a quick response in devices to make accidental mistakes in handling poisonous substances less frequent, if not impossible. One poison signal is shown herewith, in which a rubber band, armed with small rubber spikes projecting from it, is placed about a bottle, round or square boxes or packages in which poisonous substances are offered for sale or distribution, giving an unmistakable warning to any person picking up or handling it. The band is very flexible and there is sufficient elasticity in the rubber of which it is made to allow it to be placed about bottles of various sizes and shapes.



VIBRATING GRINDSTONE NEW INVENTION

Instead of revolving, a novel grinding tool has been placed on the market which vibrates to and fro rapidly in



Electrical Vibrating Grinder

a horizontal plane. The stones, one for roughing and the other for finishing, are given a short-stroke vibration by a small driving motor, running at 1,400 revolutions per minute. Small wedges hold the stones in place, and the stones may be easily removed and replaced by any desired kind of polishing or grinding surface. The tool is so constructed that it operates noiselessly, and a cushioning arrangement is employed to avoid shocks at the ends of the stroke. The power taken is about one-tenth horsepower.

FORTIFYING THE PANAMA CANAL

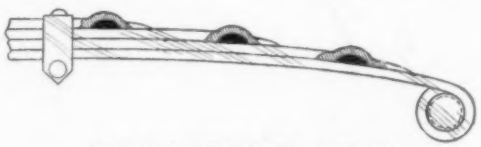
Having invested nearly $375,000,000 in the canal, the United States is intent upon safeguarding that tremendous outlay against the possibility of damage through foreign war. Fortification of the canal has been undertaken purely as an insurance matter. It is sought to make it impossible in time of war, for any enemy to take possession of the waterway, or to damage it to such an extent that the ships of the United States could not use it at will.

Guns of 14 and 16-in. caliber will be placed at forts guarding both the Pacific and Atlantic entrances, commanding a radius of 15 miles. The forts at the Pacific entrance are constructed on three islands in Panama Bay, at the very beginning of the canal, Flamenco, Perico, and Naos. These are huge masses of volcanic rock, behind which, safe from the fire of any ship, no matter how powerful, the forts stand. The great Miraflores Locks are seven miles inland from the forts, and no gun at the present time is powerful enough to send a shell the 22 miles intervening between the outside of the zone of fire from the forts and those locks which control the canal. Even with the marvels of modern gunnery it would be as difficult to place a shell, even if it could be thrown that far, as for a rifleman to hit a lead pencil at a distance of 2,000 yards.

The Canal Zone will be a military reservation, with ample guard always on duty, with field artillery, and wireless equipment which will be in touch with naval stations at all times, and instant alarm will be given of threatened attack from any source. Three regiments will be stationed at Culebra, a regiment of marines at Balboa, and a full force of artillerymen at the forts.

SELF-LUBRICATING SPRINGS NOW MANUFACTURED

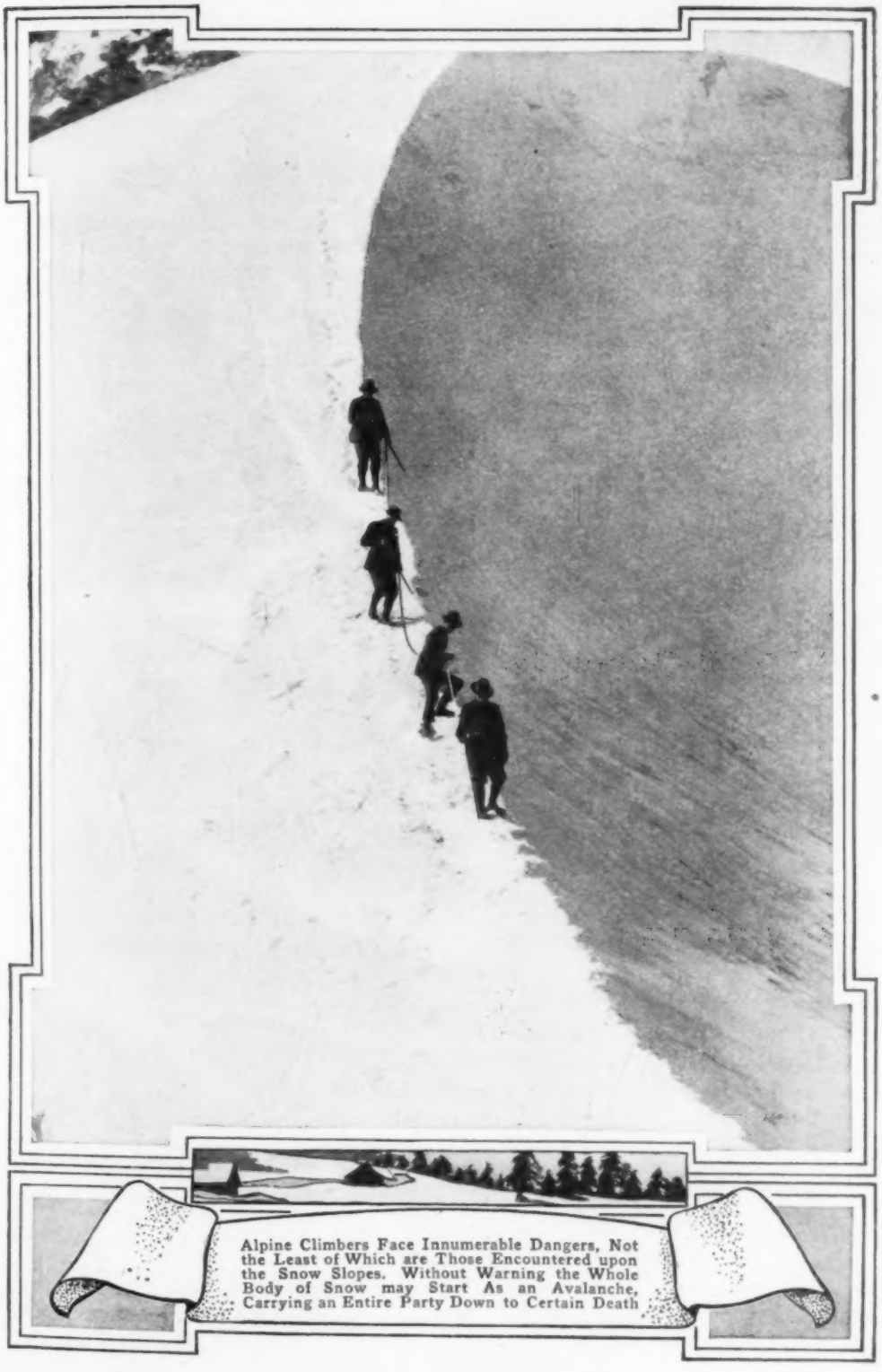
Automatic lubrication of leaf springs is accomplished, according to a recent design for which patent is sought, through small cups or depressions, formed near the ends of the leaves and filled with heavy grease. This lubricant is evenly distributed by the motion of the different members of the



Leaf Spring Which Greases Itself

spring upon each other, the largest amount of the lubricant being spread at the point where the greatest relative movement occurs.

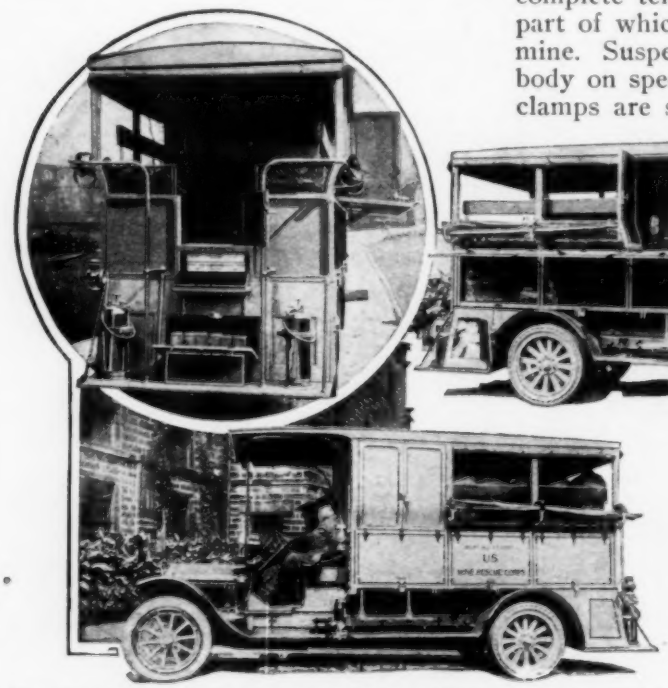
HOW ALPINE MOUNTAINEERS RISK THEIR LIVES



Alpine Climbers Face Innumerable Dangers, Not the Least of Which are Those Encountered upon the Snow Slopes. Without Warning the Whole Body of Snow may Start As an Avalanche, Carrying an Entire Party Down to Certain Death

MINE-RESCUE MOTOR TRUCK EFFICIENT FIRST AID

To rescue, revive, and treat entombed and injured miners and thus reduce the loss of life and lessen the injuries received in disasters in the coal mines of the United States, the Bureau of Mines has evolved a new plan of relief work involving the extensive use of motor rescue trucks of special design, equipped with all the paraphernalia known to science in relief work. The new vehicle is a veritable hospital, carrying every piece of portable equipment that is useful in rescuing miners, quenching flames, resuscitating the unconscious and administering first aid. Instant accessibility is given by having a place for everything and keeping everything in its place. Under the driver's seat are 10 reviving outfits. Six oxygen tanks lie on crossframes beneath the body of the car, so they can be pulled out quickly. On the left side of the chassis is an oxygen pump, operated by the power of the motor. Crowbars, tent poles, picks, shovels, sledges and axes, saws, hose couplings, reducers, spanners, and a reel of ½-in. rope are conveniently ranged on either side, while a complete telephone system is carried, part of which is to be taken into the mine. Suspended on the outside of the body on specially arranged hooks and clamps are stretchers, fire extinguishers, and mine lanterns. Two first-aid boxes and a pump are carried in compartments. The truck is equipped with an 8-in. swivel headlight, mounted on the dash. Seats for 10 operators are found in the body of the truck, protected by curtains when necessary, and the driver's seat accommodates two persons.



Compartments Open, Showing Supplies

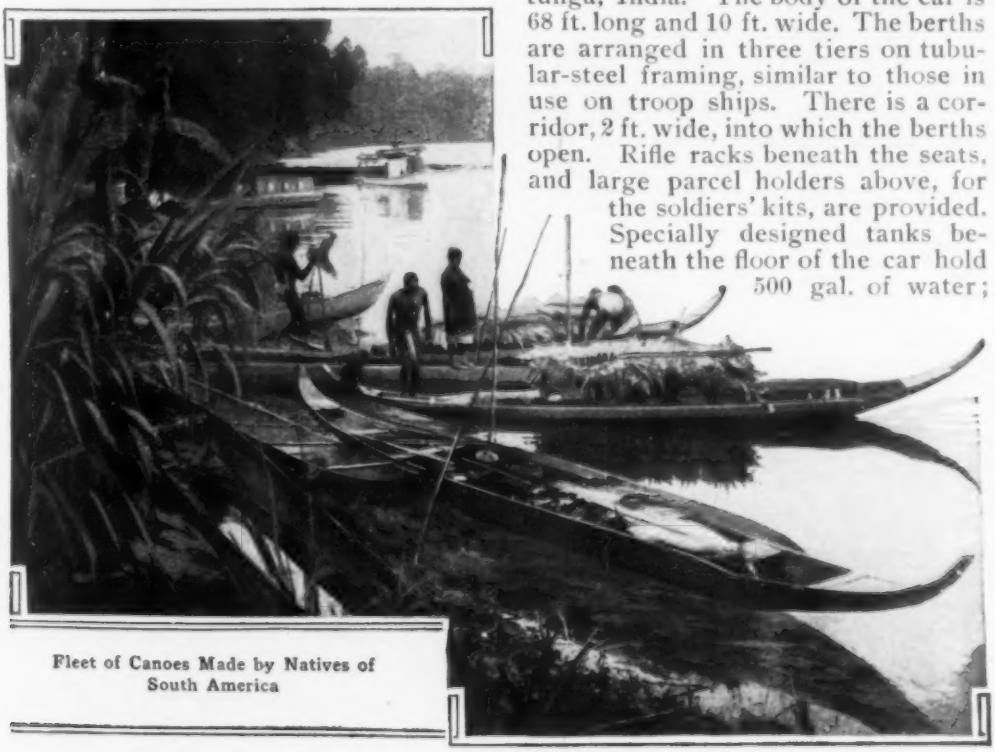
New Type Rescue Truck, Ready for Work. Above, Rear View of Truck, Showing Seating Capacity and Fire Extinguishers

PUMPING A BILLION TONS OF WATER A YEAR

Fifteen tons of water must be pumped out of the mines for every ton of anthracite coal produced in Pennsylvania. As the more accessible coal seams have been exhausted, shafts have been sunk deeper, and the volume of water to be pumped out has increased rapidly. Statistics give the production of anthracite coal from the Pennsylvania fields as a little less than 70,000,000 tons of hard coal per year, which, on a fifteen-to-one basis, makes the water pumped amount to over a billion tons in a twelvemonth.

BOAT MAKING BY DJOCKAS INTERESTING PROCESS

The black natives of Dutch Guiana, called Djockas, are adepts in boat making, their craft being light and extremely graceful. The only tools used are an ax, a cutlass and a knife. A tree is selected in the standing forest, often miles from a watercourse, and is felled and roughly hewn into shape where it falls. With fire and the ax, the interior is partly hollowed and the log then dragged through the thick underbrush to the waterside. Carefully removing most of the interior, the boat is filled with wet sand, or is submerged in the water until the sides become somewhat softened, permitting them to be bent outward, when they are stayed with stout sticks and the seats are fixed in their places. The ends are shaped and triangular pieces of wood are fitted into the stem and stern, the sides and squared ends of the canoe are raised by the addition of a plank, or extra streak, and the junction of this streak with the canoe is carefully calked with shreds from the inner bark of certain trees and then pitched with resinous gum, mixed with beeswax. If the canoe is to be used for long journeys a tent is added for the protection of the goods, usually in the form of a mat of sticks, woven and filled with palm leaves. This covering is perfectly waterproof and may be placed or removed in a few minutes. In these canoes the natives spend much of their lives and traverse great distances to trade.



Fleet of Canoes Made by Natives of South America

NEW MILITARY CAR BUILT FOR SERVICE IN INDIA

Folding berths to accommodate 66 soldiers are provided in a new military railway carriage lately built in the shops of the principal railway at Matunga, India. The body of the car is 68 ft. long and 10 ft. wide. The berths are arranged in three tiers on tubular-steel framing, similar to those in use on troop ships. There is a corridor, 2 ft. wide, into which the berths open. Rifle racks beneath the seats, and large parcel holders above, for the soldiers' kits, are provided. Specially designed tanks beneath the floor of the car hold 500 gal. of water; the ends of the car are fitted with vestibules and a thorough system of ventilation is installed.

BANKS PROTECT BULLION BY STEEL MOTORS

French bankers, aroused by many recent robberies, have adopted steel-clad motors for conveying bullion, currency and other valuables through the streets of Paris, as well as distributing money to outlying banks. The automobiles are constructed with an all-steel body, entirely inclosed, except in front. Admittance to the interior is from the front of the vehicle, where an armed guard sits beside the driver.

Motor Dreadnought That Foils Robbers

REFRIGERATOR STEAMERS FOR PANAMA CANAL

Several concerns engaged in the shipping of citrus fruit from California are making preparations for transporting large quantities of this product from the Pacific coast to Europe through the Panama Canal. One shipper is building six fast steamships equipped with every fruit-saving device. Holds properly refrigerated will hold 20,000 boxes of fruit, and passage to Europe is promised in 21 days.

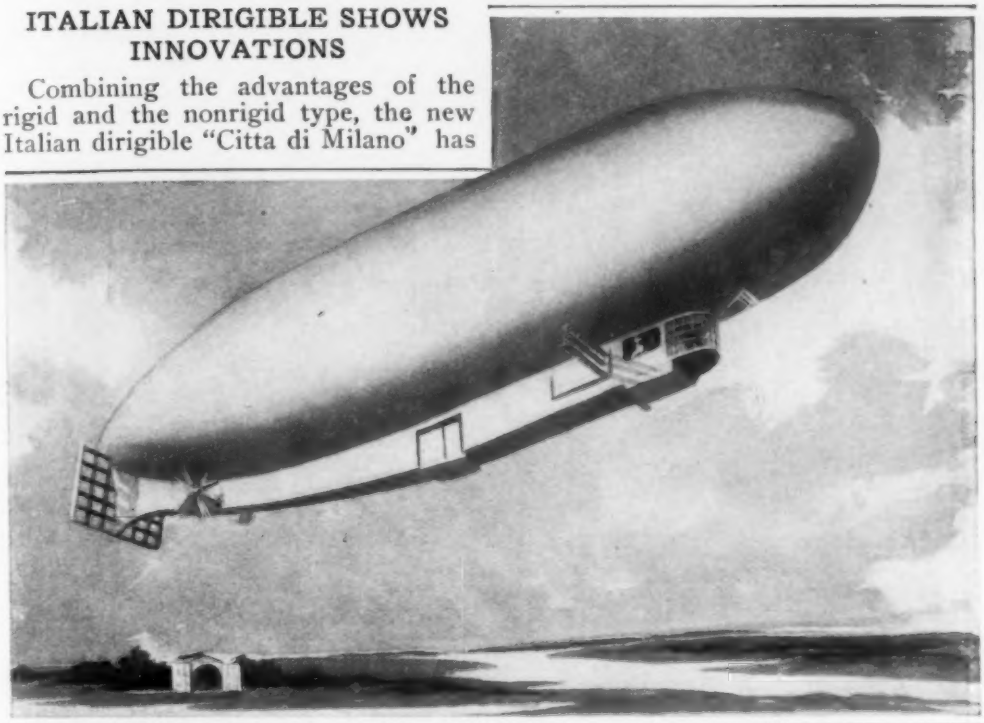
SINKING SCHOONER TOWED INTO HARBOR

Almost cut in two in a collision with a steamer, the three-masted schooner "John D. Spreckels" of San Francisco, laden with a cargo of salt codfish from Alaska, did not sink immediately. The forward part of the wrecked boat filled with water and sank, but the cargo slid forward, partly stopping the leak, leaving the stern high and dry out of water, in which position she floated for several days, and was finally towed into the harbor of San Francisco by a revenue cutter. Most of the crew escaped by jumping on board the steamer when the collision occurred, but two were drowned in the forecastle.

Unusual Plight of a Damaged Schooner

ITALIAN DIRIGIBLE SHOWS INNOVATIONS

Combining the advantages of the rigid and the nonrigid type, the new Italian dirigible "Citta di Milano" has been accepted by government experts and is now in use. With a length of 236 ft. and a breadth of 59 ft., it is remarkable for the closeness with which the lower structure hugs the under side of the gas bag. Two motors of 100 hp. each drive the dirigible, which is of the Forlanini type, at a speed of 45 miles an hour. The propellers are 13.7 ft. in diameter and make 260 revolutions per minute. The gridlike stabilizer at the rear of the car is another innovation.

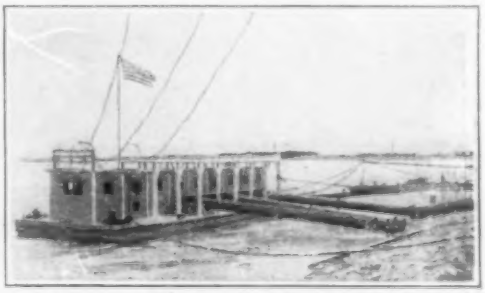


Courtesy The Engineer

New Type of Dirigible Accepted for the Aerial Navy of Italy

OUTWITTING THE MISSOURI RIVER

The changing channel of the "Big Muddy" is proverbial, and when the engineers in charge of the government reclamation project at Williston, N. D., came to establish the pumping station, which is to send water through the ditches on more than 25,000 acres of bench land near that place, they conceived the idea of putting the pumps on a barge, which could change its position with the changes of the river. As no one can say that the shore line of today will be the same a year hence, the engineers solved the problem in a novel manner. The pipes were made with flexible joints, a huge diverting boom built to keep floating trees and drift away from the pumps, and the barge anchored by guy lines to the shore. The power is electric and is derived from a plant 20 miles away.



Novel Pumping Station of Irrigation Project

CURIOUS VEHICLES IN USE THE WORLD OVER—3

Such a Scene as This is Not Uncommon in the Cities of India. The Photograph Shows a High-Caste Hindu Girl being Carried in a Palanquin through the Streets of Calcutta. In Asia, Where Human Beings are Even Cheaper than Horses, This Means of Transportation is Not as Expensive as It would Be in America

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CURIOUS VEHICLES IN USE THE WORLD OVER—4

In the "Low Countries" of Northern Europe the Humane Societies have Not Yet Aroused Public Sentiment against the Commercial Use of Dogs, and These Animals are Employed for Almost Every Purpose for Which Horses are Used in America. Often They Haul Even Heavier Loads Than This Dutch Matron, Photographed near Enkhuysen, Holland

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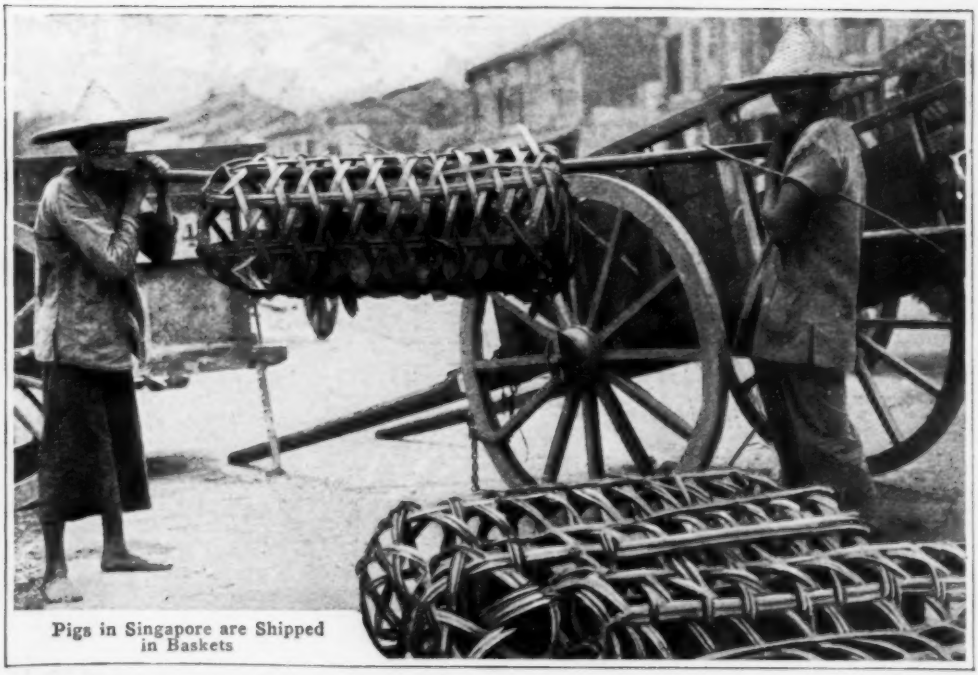


Pigs in Singapore are Shipped in Baskets

SELLING A PIG IN A POKE IN SINGAPORE

Although the parcel post may not welcome the shipment of the great American hog in the United States, natives of Singapore have adopted a basket compartment for the conveyance of pigs, big and little, which might lend itself easily to the requirements of parcel-post usage. Stout framework baskets or cartridge-shaped receptacles of native wood, containing one porker, are easily handled by thrusting a long pole through the mesh.

STABILIZER FOR AEROPLANE CALLED "PANCAKE"

A disk of canvas, 7 ft. in diameter, slightly dished and mounted above the plane of an air craft is the latest device evolved in the effort to enable airmen to fly successfully without using ailerons. The principle involved is that the curve of the stabilizer is such that when the aeroplane starts to tilt sideways, the air banking against the lower side of the disk will bring it back to level. Although the stabilizer undoubtedly tends to increase the head resistance of the machine, in actual flight there seems to be no

"Pancake" Stabilizer on Biplane

diminution of speed, as it is not necessary to use the ailerons, which of course act as a brake. When making a turn, the machine banks automatically, and there is little or no tendency to pitch. The sides of the disk rise but 10 in. above the horizontal at the extremities.

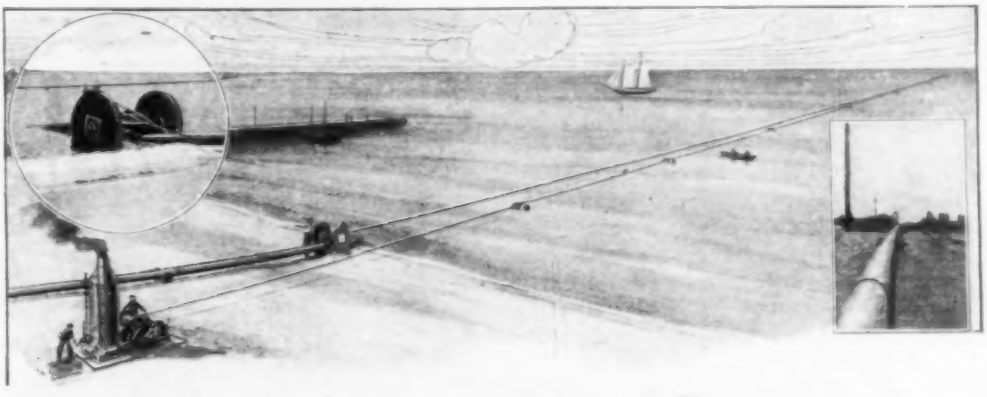
LAUNCHING A BIG SEWER OUTLET IN ATLANTIC

Half a mile of 12-in. wrought-iron pipe, jointed together, presents some slight difficulties when it is proposed to place it, as the authorities of Ocean Grove, N. J., purposed, straight out in the Atlantic as an outlet for their sewer system. The great weight, the necessity of avoiding choking by sand, or damage by the swell, presented problems calling for original treatment. Joined together, the pipe was placed on small wooden trucks, the outer end being attached to a cast-iron plate with two cradles and bent upward at an angle of 45 deg. To prevent the water from entering, while the pipe was being run out to sea, its end was capped with a wooden plug, like a cork in a bottle, closely but not tightly fitted, and heavily lubricated with white lead at the joint. Somewhat over half a mile from shore were placed five ship anchors, firmly imbedded, with a sheave attached to them through which was passed a ⅝-in. steel cable. One end of this cable was attached to the iron bedplate of the outlet pipe, while the other was wound around the drum of a hoisting engine. As the engine was started, the pipe, partly submerged, swung easily through the water, free from all obstructions, and in two hours and a quarter the outlet was in place. The outer end is 35 ft. below sea level.

HANDY SHOPPING BAG FOR AUTOMOBILES

The automobile offers to shoppers great saving in time and exertion, but there is often very little space in which

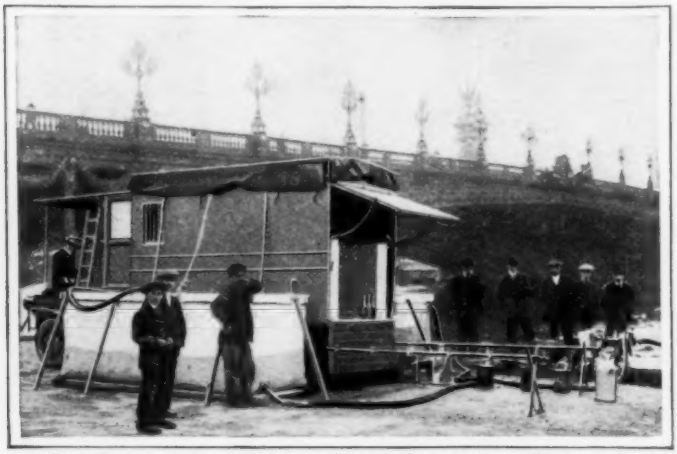
to place the various packages acquired in a round of the shops. A recent convenience offered to automobile owners is the tonneau luggage bag which is strapped to the robe rail, taking up but little room when not in use, and offering a safe and convenient storage for parcels. There are two small pockets and one large one. The bag is made of stout cloth or imitation leather and may be matched exactly with the upholstering.



Sending a Sewer Out to Sea. Ingenious Method Used to Float Big Pipe As Outlet for Sewer System

AUTOMOBILE THAT CARRIES STERILIZING DEVICE

For field maneuvers the French army has adopted a simple method of sterilizing the water supply of the troops by means of the automobile trucks used in transporting stores. The sterilizing process, which is electric, is not new, but utilizing the motor, which is switched to drive the machinery of the electric sterilizing plant, is a novel application. Collapsible canvas tanks at either side of the motor truck contain the water to be sterilized.



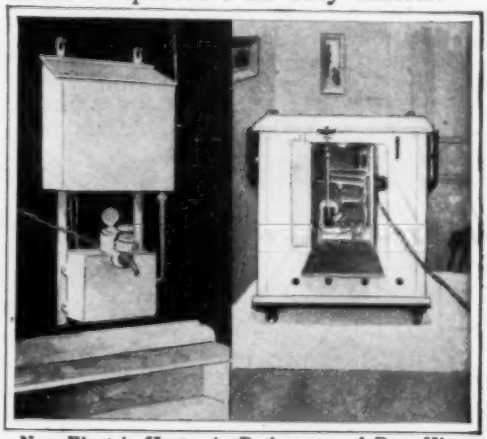
Installation of Water Purifier During French Army Maneuvers

CONCRETE TILE BLOCKS FOR CANAL-ZONE BUILDINGS

Hollow concrete tile blocks are to be used in the construction of many of the permanent government buildings in the Panama Canal Zone and a factory for making these blocks is now in operation under the supervision of the Canal Commission. The process used is a new one and employs steam instead of dry heat for drying the blocks. The process of molding is carried out by automatic machines much like the ones ordinarily used, and the blocks are then sent to curing rooms, where they are treated with a combined steam and water dripping process calculated to set up and harden the blocks so that within a period of 48 hours they are ready for removal to the storage yard. The plant is to be operated in two shifts of 7½ hours each, and it is estimated that the daily output under this arrangement will be about 5,000 blocks.

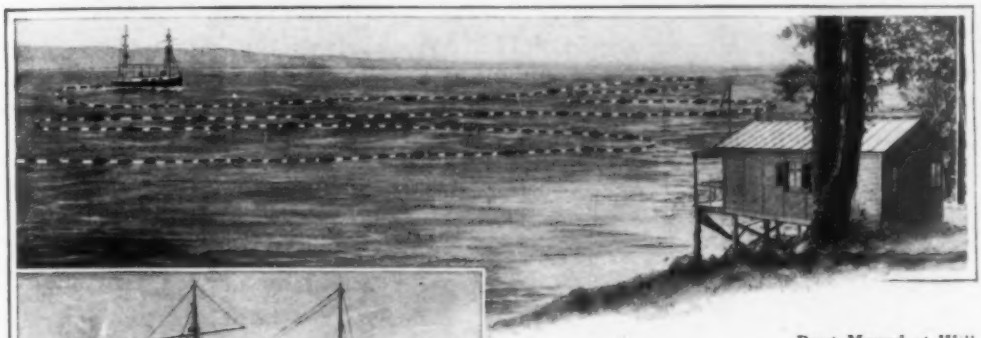
ELECTRIC RADIATOR NOW ADAPTED TO THE HOME

In Switzerland, Sweden, and Norway, where electrical energy can be obtained for approximately 1 cent per kilowatt-hour, heating systems using electric current are now installed in homes, affording a convenient and economical method of securing an even temperature in living rooms. Recently a new type of radiator has been constructed, in which the heating elements are incased in slabs of "steatite," a variety of talc, found to be particularly adapted to this use, as it is not only highly insulating, but has great heat-storing capacity. The radiators are, in fact, a sort of heat accumulators or storage batteries. They are quickly heated, but give off heat slowly, making the automatic regulation of the room temperature an easy matter.



New Electric Heater in Bathroom and Rear View of Living-Room Heater, Open

MOVEMENTS OF BOATS CONTROLLED BY WIRELESS



Boat Moved at Will by Wireless Impulses from Shore Station

Vessel Equipped for Wireless Control of Machinery and Steering Gear

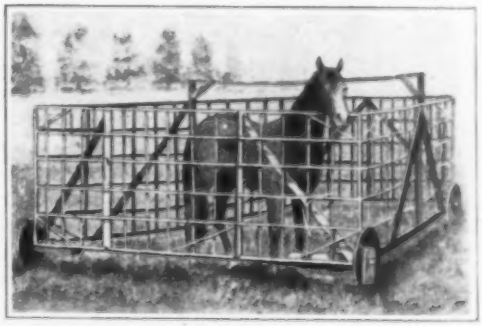
An improvement in the method by which the movements of distant boats, aeroplanes or torpedoes may be controlled by wireless impulses sent from land stations is now under the observation of government officials. Heretofore, while it has been possible to operate a torpedo from the shore at an eight-mile speed, such control could always be interfered with by an enemy. The wireless apparatus operating the motor and rudders would respond to impulses sent from hostile stations as readily as from its own base. Now, however, a mechanism has been constructed which is delicately sensitive to control from the land station with which it is attuned, but free from outside interference.

FISH IS FROZEN BY NEW METHOD

A novel way to freeze fish for shipment has been invented in Denmark, which consists of dipping the fish in fresh water and then thrusting it into a vessel containing refrigerated brine. The fresh-water film around the fish congeals instantly, preventing the access of the salt from the brine. So quickly does this method work that a live codfish 18 in. long was frozen hard enough to be sawn in 15 minutes.

PASTURE FENCE ON WHEELS

A portable pasture fence, made out of the framework of set pieces of fireworks, is the interesting solution offered by an Illinois farmer to the problem of caring for a spirited horse which runs itself out in a large meadow. The little pasture is 16 by 20 ft. and the fence is mounted on wheels. One man can move it easily. The horse seems quite contented, and when one piece is grazed sufficiently, the fence is moved to a fresh piece.



A Movable Pasture for a Nervous Horse

ALASKA MINER USES BICYCLE BOAT

When a report of a new gold field reaches one of the Alaskan mining camps there is a rapid exodus, for the rule of the gold diggings is "first come, first served." All kinds of craft are used to navigate the streams of the north, among the most curious of which is the bicycle boat, built by a miner with a mechanical turn of mind. Two narrow skiffs, rigged close together, uphold a bicycle frame in such a manner that the pedals operate a paddle wheel, and the rudder is actuated by the handlebars. The rider is able to make good progress even against a stiff current.

Swift Little Bicycle Boat Used in Rush for New Gold Fields

BURLAP COVERING FOR IRON PIPE

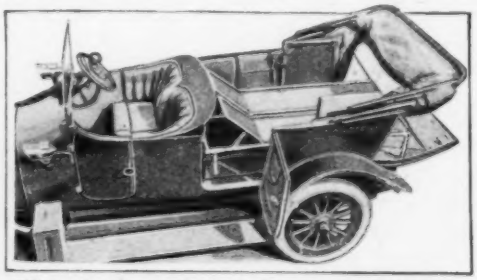
A new protective process for iron piping to be used underground consists in winding impregnated burlap in spiral strips over the coating of mineral rubber ordinarily used for this purpose, and it is claimed that this process not only protects the pipe from corrosion, but supplies a covering that is strong mechanically. The pipe is first dipped in the liquid mineral rubber, and the burlap is thoroughly soaked in the same material. The pipe is then placed in a wrapping machine, and as it is rotated the burlap is wound around it tightly, the whole process being mechanical. The result is a spiral-wound burlap covering, which, as soon as the mineral rubber has cooled, sticks firmly to the pipe.

REMARKABLE SHOWING BY ELECTRIC PLANT

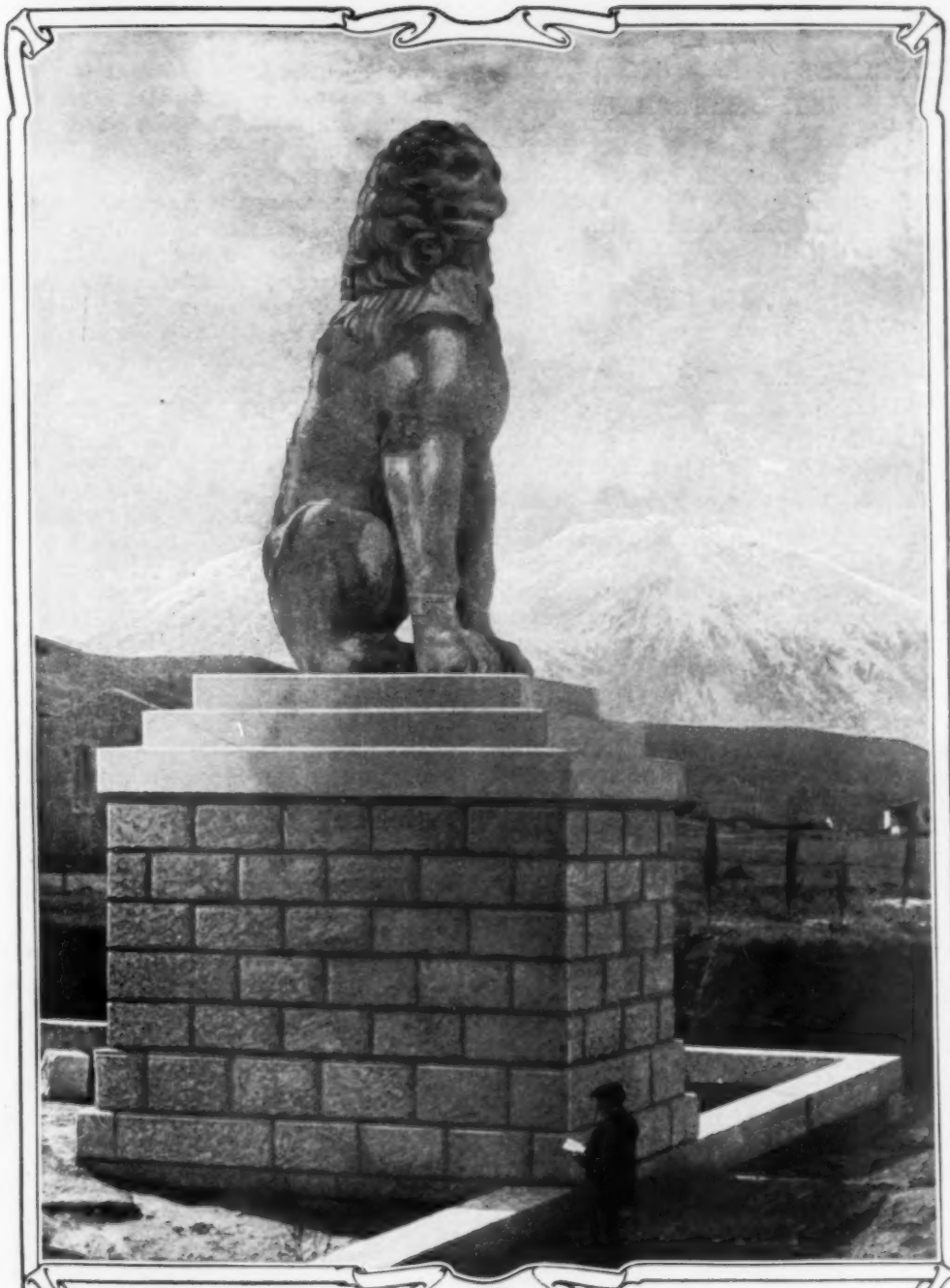
A substantial profit is being made at Pasadena, Cal., on current delivered to the consumer at the rate of 5 cents per kilowatt-hour, according to the annual report for the fiscal year ended June 30, 1913, covering the operation of the electric light and power plant built in that city in 1907. The total cost of manufacturing and distributing current, including depreciation of plant, was a trifle less than $2\frac{87}{100}$ cents per kilowatt-hour for the period covered by the report, while the total cost on the basis of current sold was less than $3\frac{2}{3}$ cents. The rate in most of the neighboring cities is 8 cents per kilowatt-hour, or 60 per cent higher than that at Pasadena.

CONVERTIBLE TOURING CAR USED AS AMBULANCE

A German firm is making a touring car which may be converted into an ambulance in an emergency. None of the usual outside features of the ambulance design is present and the car, converted, would not attract attention. Stretchers which come into play when the rear seats are raised, are fixed at the head and project slightly in the rear. Covered by a canvas curtain, the patients are protected from the weather as well as from sight.



When the Car is Used for Touring the Stretchers are Kept under the Seats



A Stone Lion, Erected Centuries Ago at Chaeronea, Greece, to Commemorate the Victory of Philip of Macedon over the Theban and Athenian Forces, for Many Years Lay Broken, Half-Buried on the Spot, and Only Recently did Public Spirit in Greece Demand That the Memorial be Restored. Today It Stands Again a Funeral Monument, Not Alone to Theban and Athenian Dead, But to an Early Republic Which could Not Survive the Jealousies of Its Confederated States. Chaeronea Lies at the Head of the Defile Presenting the Last Serious Obstacle to an Invasion in Central Greece. It was at This Spot, About Two Centuries Later, That the Roman Legions under Sulla Crushed the Myriad of Mithridates

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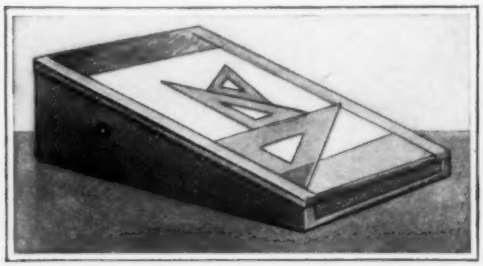
TACKLESS DRAWING BOARD FOR DRAFTSMEN

A drawing board for making rapid sketches is shown in the illustration, and possesses several conveniences

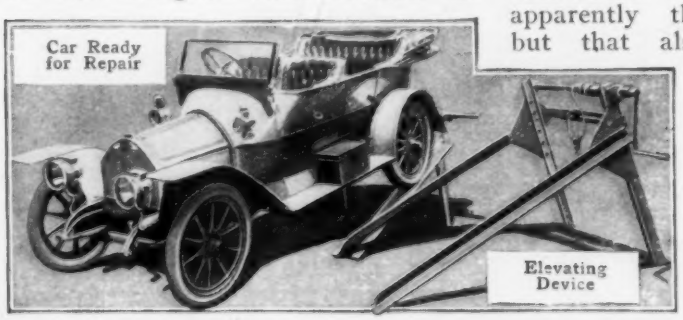


Sketching Board Does Away with Thumbtacks

not found in the ordinary kind. The paper is used in a roll, placed within the boxlike base of the drawing board, and is pulled through the spring-actuated wing at the top of the board and fastened at the bottom by a similar wing. Rubber disks inserted in these wings permit tight stretching of the paper and obviate the use of thumbtacks, often an obstruction to the use of a T-square. A mahogany straightedge along the left side of the board permits the use of large triangles in place of the T-square.

DEVICE TO ELEVATE MOTOR CARS

For the automobile owner who makes his own repairs a winch elevator has been designed which obviates the



necessity of a pit for inspection. Two lengths of flanged steel plate are supported at some height from the ground at the opposite ends by steel struts suitably braced. Across the top a small steel drum is attached, fitted with ratchets and a handle, the drum having a wire cable wound about it. At one end the cable is attached to a crossbeam connecting the struts, and a pulley with hook attachment permits attaching the axle of a car. When attached, the car is drawn up the incline by means of the winch, and repair or inspection is easily made.

CACTUS PLANT NEW SOURCE OF RESIN

A fruit-bearing cactus, known as the pitahaya, growing in Lower California, has been found to contain valuable resin in its bark. The plant grows wild, is from 6 to 12 ft. in height and bears a fruit that is very sweet and palatable. The resin is found only in mature plants which have died naturally and remained some time in the sun. The resin is dark in color, with a smooth surface and hard texture. When heated it is very adhesive and could be used to advantage in the manufacture of varnishes, electric insulators, and the like.

EFFECT OF WIRELESS WAVES ON BIRDS

Observations made in sections of the world where there are many wireless stations indicate that birds are disturbed in a singular way by the wireless waves. It is stated that gulls are apparently the principal sufferers, but that also large numbers of doves are in some way prevented from finding their way home when there are wireless stations in the line of flight. This strange phenomenon is attributed to some effect of the ether waves not yet understood.

¶Fire-killed Alpine fir and Engelmann spruce of Colorado are now being used in making a good grade of excelsior.

FRENCH LOCOMOTIVE USES NAPHTHALENE AS FUEL

An internal-combustion locomotive of a novel type, which is designed to use naphthalene as a fuel, has been brought out in France. Since naphthalene is a solid which must be both melted and vaporized, provision is made for starting the locomotive with gasoline, benzol, or some other volatile liquid, separate carburetors being installed for the different fuels. The tank in which the naphthalene is carried is inclosed in a water jacket, and the arrangement is such that the water is heated to the boiling point by the exhaust from the engine. In this way a constant temperature is provided which is more than sufficient for melting the naphthalene, which, as fast as it is melted, is lifted to the fuel tank by a pump operated by the engine. The shift from gasoline or benzol to naphthalene is readily made by means of a three-way valve. The motor is a 4-cyl., 70-hp. engine of the ordinary automobile type, which can be run at varying speeds of from 250 to 1,000 revolutions per minute. A speed of about 12½ miles an hour with a drawbar pull of 7,700 lb. has been obtained with this locomotive, the fuel consumption being ½ lb. per horsepower-hour.

Internal-Combustion Locomotive That Uses Naphthalene as a Fuel

Suspended on a One-Inch Cable over Carquinez Straits

PAINTING ELECTRIC CABLE A MILE LONG

Four plow-steel cables an inch in diameter stretch across Carquinez Straits, a narrow part of San Francisco Bay, a mile in width, and carry high-voltage electric current, brought from the power plant at De Sabla, to San Francisco over 246 miles of wire. These steel cables must be painted at intervals, no small job at the best, but when the nature of the work is considered, it would seem that the men performing the task take their lives in their hands. The minimum height of the cables above the water is 206 feet.

¶An old city garbage dump of 10 acres' extent located near Savannah, Ga., took fire recently and burned for weeks a few feet under the surface. This curious underground fire was allowed to burn itself out, as the nearest fire hydrant was a mile away.

BED WITH NONSINKABLE MATTRESS

A demonstration was recently given on the River Seine of a nonsinkable mattress to be used as a life preserver on passenger-carrying vessels. Mattress and bed are of one piece, which has so high a flotation point that even with a heavy person on it, the top of the mattress is above the water. Marine officials in the French cabinet were interested spectators. It is claimed that had the "Titanic" been equipped with such life preservers all passengers and crew might have easily been saved.

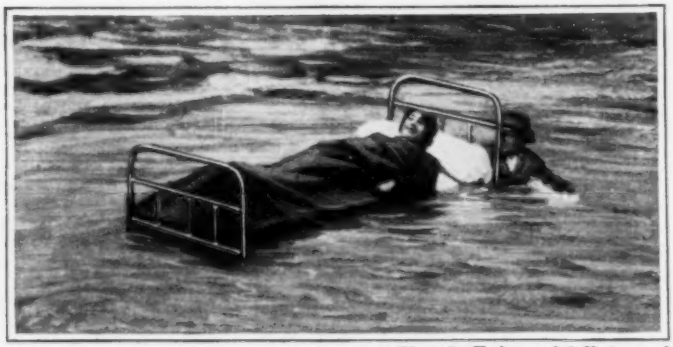


Photo by Underwood & Underwood

Interesting Experiment Made in Paris with Life-Saving Mattress

AMERICA TO HOLD RADIUM MINES FOR PUBLIC USE

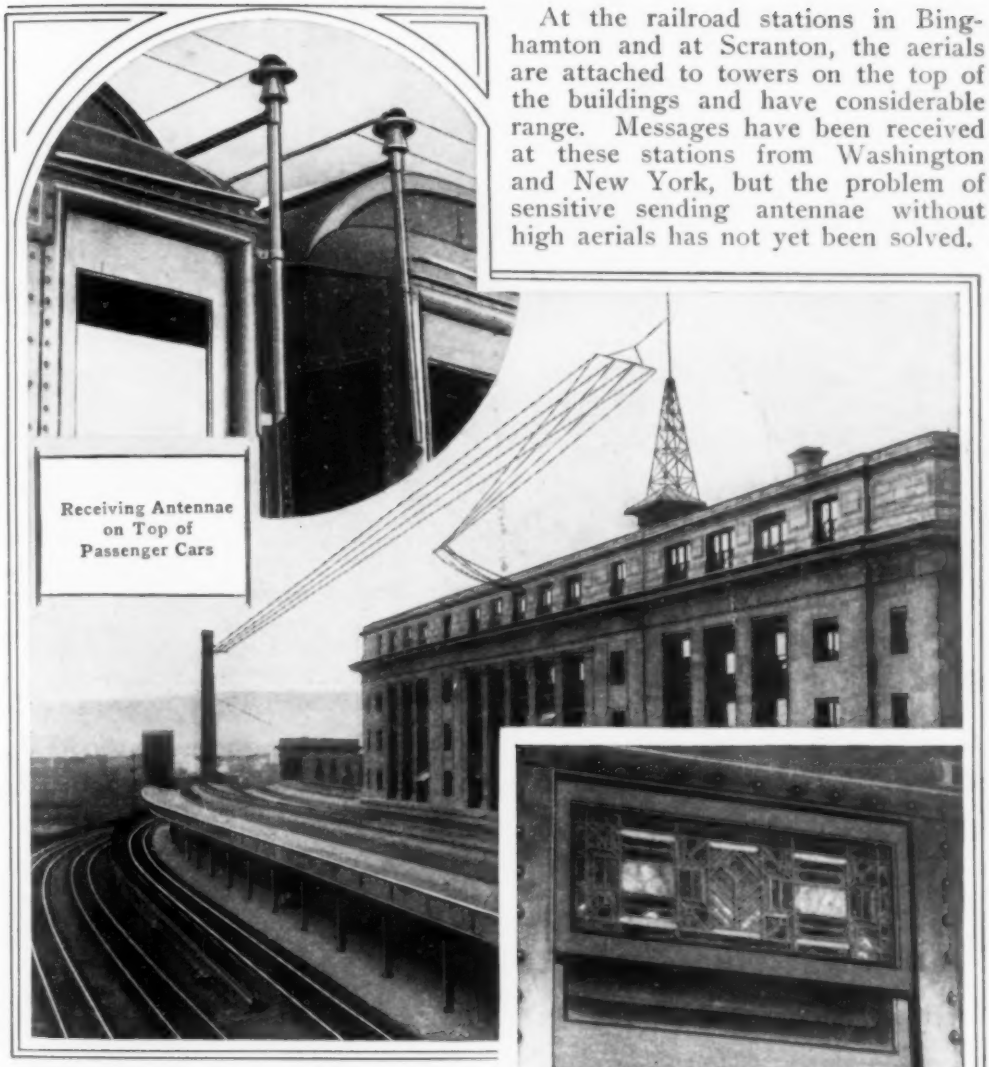
Secretary of the Interior Lane has approved the proposal to withdraw radium deposits in the United States from public entry. According to the secretary there are less than two grams of radium in the United States today, although in 1912 more than three-quarters of all the radium produced in the world was obtained from American ores. Radium-bearing ores are now sent to Europe, where laboratories in France, Austria, Germany and England treat the mineral by secret processes, and little radium is sent to the western hemisphere, nor can any be procured on short notice. It is proposed to erect a laboratory in Denver where radium ores will be treated by a process invented by chemists in the Bureau of Mines, and the radium obtained will be put in the hands of the United States Public Health Service for public use.

WIRELESS ON MOVING TRAIN BRINGS AID IN EMERGENCY

When the conductor on the Lackawanna Limited was suddenly taken ill a few weeks ago, a wireless message was flashed from the moving train to the office of the superintendent in Scranton, Pa., 30 miles away. Half an hour later, when the train rolled into the station, a relief conductor stepped on board assuming charge, while a physician waited to hurry the sick man to the hospital.

This is the only train in the world today that is equipped with a full set of wireless apparatus, but the officials of the railroad predict that the time is not far distant when wireless equipment will be required on every train, even as it is now required on vessels. Not only emergency aid but the ordinary routine of train dispatching is contemplated, with such train control as will serve to make collisions and accidents remote, if not impossible.

The equipment used is interesting, the antenna being a rectangle of wire projecting a few inches above the top of each of four cars, supported by a stanchion 2 ft. high, at each car corner. An operating compartment has been built in the rear end of the second car from the front, so that the receiving and sending instruments are beneath the center of the aerial. The power is obtained by cutting in on the electric-lighting system of the train, and the "ground" is provided by at-



Receiving Antennae on Top of Passenger Cars

Sending Antennae on Top of Station at Scranton

At the railroad stations in Binghamton and at Scranton, the aerials are attached to towers on the top of the buildings and have considerable range. Messages have been received at these stations from Washington and New York, but the problem of sensitive sending antennae without high aerials has not yet been solved.

taching a wire to the metal framework connected with the wheels, the current seeking the earth through the rails. From the antenna the wires enter the car through a conical extension over the rear window above the operator's compartment and into the receiving coil. From the fact that the aerials extend so short a distance above the tops of the cars, it is as yet impossible to send messages to a greater distance than 50 or 60 miles, although messages may be caught from stations hundreds of miles away.

Wireless Operator in Compartment on Moving Train

BURNING HOUSE ADVERTISES REAL-ESTATE SALE

A unique advertisement attracted a crowd of buyers in Los Angeles when a real-estate dealer burned a substantial house recently, just to bring spectators to the tract he was placing on the market. Thousands of visitors flocked to the scene, and, it is said, over $12,000 worth of lots was disposed of while the house was going up in smoke.

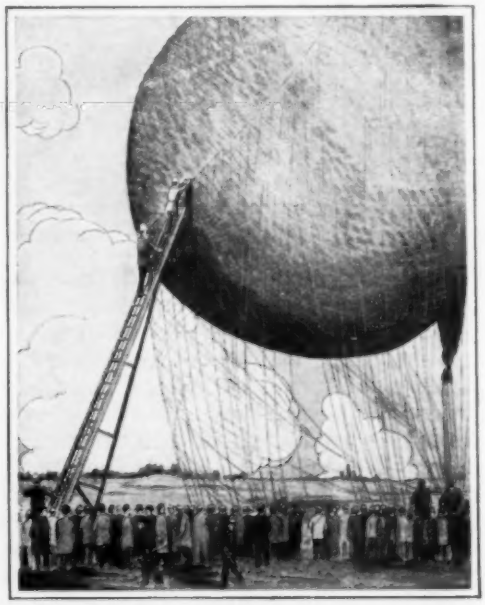
Selling Lots While House Burns

SWIMMING RESTRICTED IN PANAMA CANAL

To avoid serious accidents to persons swimming and bathing in the Panama Canal, Colonel Goethals has authorized certain points at Cristobal, Gatun, Gamboa, Empire, Culebra, Paraiso, Pedro Miguel, Miraflores, Corozal and Balboa to be designated for the purpose, forbidding it in other places. Additional points to be used by the soldiers at Camp Otis and Camp Elliott are to be provided, but civilians are prohibited from using them. Suitable signs, floats and necessary life-saving appliance will be provided at the points mentioned.

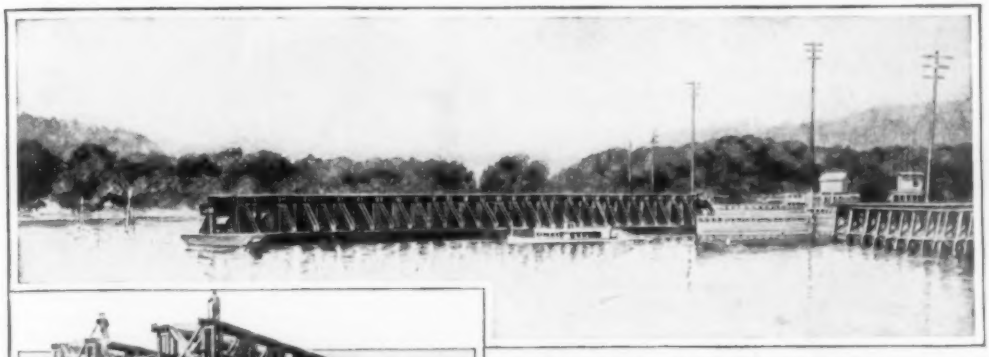
FIRE DEPARTMENT REPAIRS BALLOON

At a balloon race in Germany last fall, the basket of one of the balloons, in rising, collided with the envelope of one of the others, tearing some of the meshes of the net surrounding the gas bag. No way of repairing the damage, save emptying the bag, seemed possible, and this was rejected on account of the loss of time involved, as well as the expense. It was suggested that the fire department be called, and repairs made from a tall ladder. The firemen, however, volunteered the use of the water tower, from the top of which, when extended, the broken lines were soon mended, and the balloon proceeded in due course in the race.

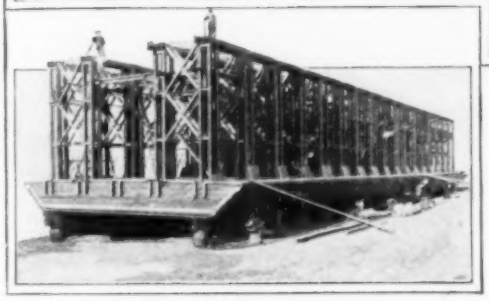


Firemen Mending a Torn Balloon from Water Tower

PONTOONS CARRY RAILROAD ACROSS MISSISSIPPI



Pontoon being Swung into Place by Steamer

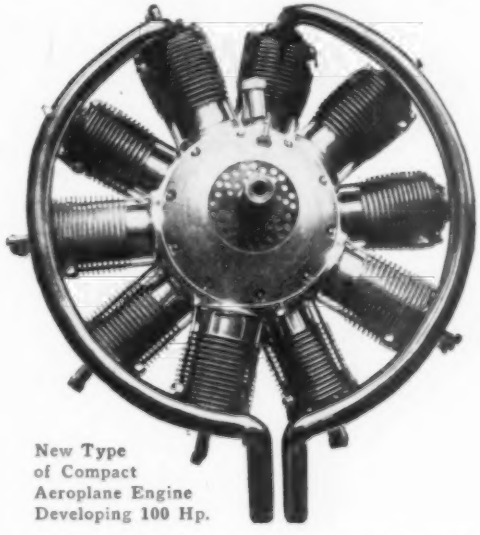


Building the Big Pontoon for the Prairie du Chien Bridge

The Mississippi River is crossed at Prairie du Chien, Wis., by a pontoon bridge which in these days of concrete arches and cantilever construction presents some interesting features. The boat is 210 ft. long, 58 ft. wide and contains over 278,000 ft. of lumber, weighing 3,508 tons, besides many tons of iron and other construction material. It took a ton of oakum to calk the structure, and the lumber was thoroughly soaked in a creosote preparation to protect it against the ravages of decay. Upon the deck of the pontoon are erected four rows of upright posts which will guide the automatic hoist for raising and lowering the tracks across the center of the pontoon, and act as braces for the entire structure. The motive power for opening and closing the bridge, as well as for working the hoist, is contained in a small steamer hitched to the pontoon. This power boat is 60 ft. long and is a stern-wheeler, with an 80-hp. boiler, and operates a big sprocket-wheel winch and chain in swinging the bridge. An adjustment permits shunting the power over to the hoists when necessary, through the differing levels occasioned by the various stages of the river. The pontoon complete cost $70,000.

TEN-CYLINDER ENGINE FOR AEROPLANE

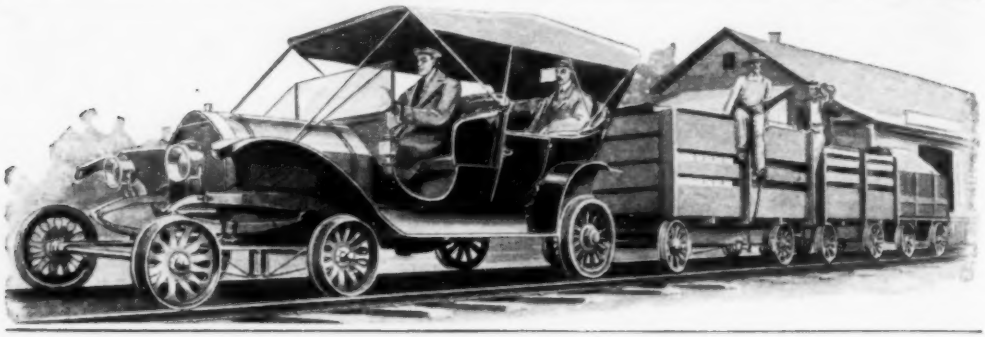
Navigation of the air was made possible through securing an engine which was both light and powerful. Marvelous as the first engine seemed, each year brings new models, more compact, more powerful and more trustworthy than before. At the Aero Salon in Paris a ten-cylindered engine was shown, developing 100 hp., which attracted much attention.



New Type of Compact Aeroplane Engine Developing 100 Hp.

LOCOMOTIVE MADE OF OLD AUTO HAULS TRAIN

The whole power equipment of a railroad in Kansas consists of a rebuilt six-cylinder touring car, which maintains the scheduled run on the Kansas, Southern and Gulf Railroad, between Blaine and Westmoreland, a distance of eight miles. Years ago the road, which was projected to connect the wheat fields of the Dakotas with the gateway of the Gulf, at Galveston, went into the hands of a receiver. Only eight miles of the road had been built, but there was considerable traffic, and the road was operated until the equipment wore out. Then the receiver sold the two old locomotives for scrap, and realized enough to purchase and rebuild the touring car, equipping it with a front truck with wheels from an old box car, and drivers from a passenger coach. In 15 months over 100,000 tons of freight were hauled by the "gasoline locomotive."



Touring Car Transformed into Locomotive

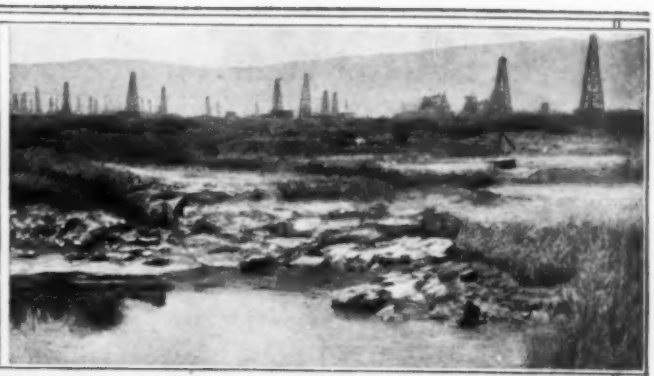
PREHISTORIC ANIMAL TRAP YIELDS FOSSIL REMAINS

Caught by the yielding asphalt, animals now long extinct were drawn to their death as they sought water or preyed upon other unfortunate creatures at the springs now known as Rancho-la-Brea, near Los Angeles, California. The petroleum of southern California has an asphalt base. Unlike the fields of Pennsylvania and Ohio, the heavy oils, when evaporated, do not yield paraffin, but asphalt. The oil which wells up about the springs evaporates slowly, catching the dust, hardening into a film which will bear small animals, but clutching with firm grasp any foot that stands too long upon its yielding surface.

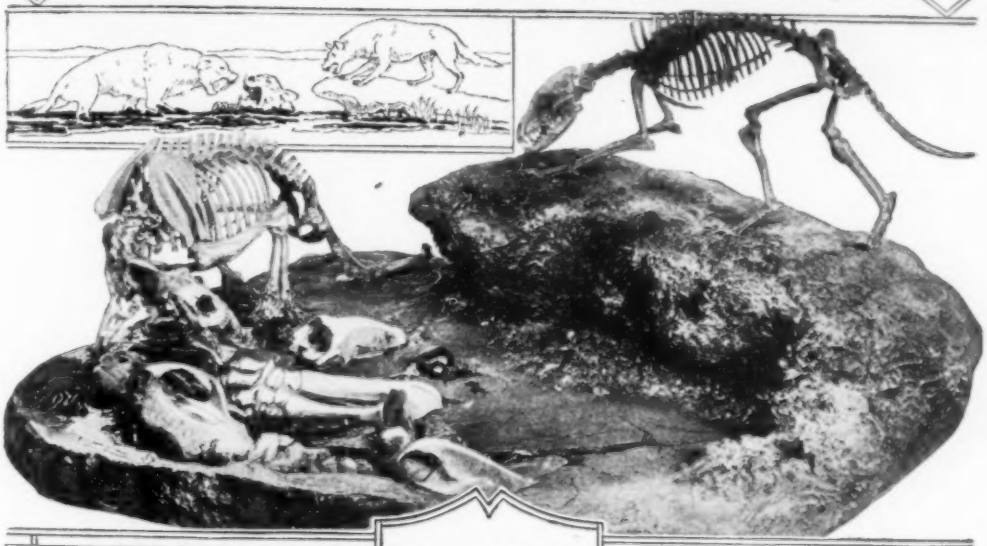
Commercial exploitation of the asphalt about these springs disclosed many bones, whole skeletons of creatures pronounced by scientists as belonging to another age than ours. Excavations carried on by the University of California have brought to light many hundreds of skulls and bones impregnated with asphalt, but otherwise little altered. Flesh and hide, horns and hoofs have been dissolved ages since, but the bones are easily cleaned and when mounted give a comprehensive knowledge of the fauna of that district when the glaciers covered a large part of this continent.

Most of the animals uncovered were carnivorous birds and beasts of prey, wolves, lions, saber-toothed tigers, eagles and vultures predominating. Then came bisons, horses, ground sloths, and others. More than 50 varieties of birds have been found, and fully as many different kinds of animals. No remains of man, no tools, nor weapons, nor other indications of his presence, no sign that prehistoric man ever saw this grim death trap in operation has been discovered.

Digging for Fossils



Present View of Prehistoric Animal Trap



Skeletons of Extinct Animals Found in California Asphalt Pool, Where They had been Trapped Ages Ago

Old Ranch House by Asphalt Pool. Bubble of Gas in Foreground

Courtesy American Museum

HOTEL CABINET VENDS TOILET ARTICLES

A cabinet, finished in nickel or white enamel, is being placed in hotel bathrooms and toilet rooms, offering to the guests standard toilet articles, including toothbrush, dental cream, toilet water, talcum powder, and the like, at standard advertised prices. By placing a coin in the slot and turning the lever the selected article is delivered, avoiding the necessity of sending the bell boy out for a hurry-up purchase, with its attendant waiting and tipping. The cabinet may also be installed in staterooms on board trains or ships.

Individual Shops for the Convenience of Travelers Give Quick Service in Hotel or Stateroom

TECHNICAL SCHOOL TEACHES AERONAUTICS

A course in aerodynamics has been established by the Massachusetts Institute of Technology, making it the first educational institution in the country to begin the work of developing the study of the science of aeronautics. It is recognized that the real advances in the knowledge that must underlie flight have come from skilled engineers. Pilots must have skill, ability, courage and the faculty of coördination, but construction of the machines utilized by them in flight must depend upon the technically trained men. Technical schools in England, France and Germany have such courses which are well attended. The University of Paris, the University of Göttingen and the National Physical Laboratory in England provide instruction under eminent specialists. Technical high schools in Berlin and Aachen also have courses in aeronautics and well equipped laboratories. Building air craft now ranks as an industry in France and Germany, the former having a thousand aeroplanes in service, and fifteen hundred airmen.

STRANGE ACCIDENT TO A STREET CAR

A street car played tag with an automobile in Chicago recently, with disastrous results for all concerned. Jamming on the emergency brake to avoid striking an automobile crossing his path, the motorman of a car passed from one shock to another till he found himself in the emergency ward of a hospital a few minutes later. The car first jumped the track, striking the automobile and demolishing it. Plunging on, the car, well filled with passengers, crossed the street, climbed the curb, and bored into the basement of a large apartment building, striking halfway through the wall. A big gas main supplying the building was broken by the impact of the runaway car, and the gas, flooding the basement, came in contact with the furnace fire, exploding in a series of detonations,

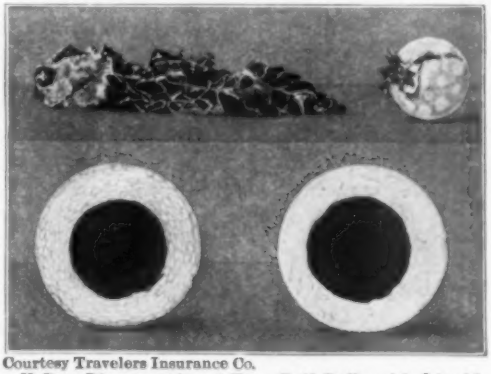
setting fire to the car and to the building. One occupant of the automobile was killed, and a dozen passengers in the street car injured, while tenants of the building were rescued by firemen with some difficulty. The fire was extinguished with little trouble, although one fireman was rendered unconscious by escaping gas.

MEXICAN LANDMARK WHERE TROPICS BEGIN

The tropic of Cancer, that imaginary line 23½° north of the equator which marks the northward path of the sun at the summer solstice, passes through Mexico. A curious monument has been erected by the Mexican government at one point on the line, a photograph of which is shown. The picture shows the southerly side, within the torrid zone. Upon the opposite side the words "Zona Templada" denote the temperate zone, while the fingers point east and west along the line of the tropic of Cancer. Two towns in Mexico lie almost directly upon the tropic, Miquihuana, on the east, in Nueva Leone, and Todos Santos on the west, in Lower California.

EXPLOSIVE GOLF BALLS MENACE TO SIGHT

The United States Golf Association has found it necessary to issue a formal warning against cutting open golf



Courtesy Travelers Insurance Co.
X-Ray Photographs of Two Golf Balls with Liquid Cores. Above, One of These Balls Cut Open, with Contents Removed

balls, owing to the fact that certain manufacturers have used acids, caustic alkalis and other sight-destroying compounds in the center of their product. Many accidents have resulted from this cause. Golf balls were originally made of paper or cloth clippings,

At This Sign the Sun Turns Back in Its Course

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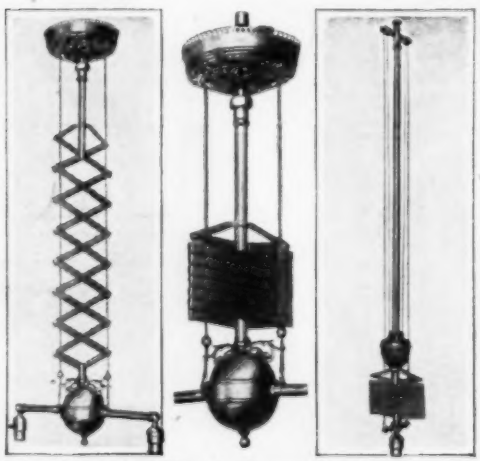
tightly pressed and sewn into a canvas cover. The solid ball made of gutta-percha was the first step toward a "live" ball, and this was quickly followed by the ball with hollow core. Then came windings of rubber thread and rubber tape over a solid rubber core, and finally the liquid core appeared. Water under high pressure was injected into a rubber bag, and this was then wound with rubber thread and tape, with a final solid coat of gutta-percha cast over it. To increase the weight of the ball, other liquids of greater specific gravity than water were sought, such as sulphuric and hydrochloric acids, or strong alkalis, and these were sometimes mixed with other substances with the purpose of forming gases which should increase the tension of the bag in which they were confined, adding to the resiliency of the ball. When curious persons cut into the golf ball, these substances or gases, impelled by the powerful pressure, squirted suddenly out and into the faces and eyes, in several instances causing total blindness.

NOVEL ELECTRIC-FIXTURE EXTENSION

A device, recently placed on the market, which permits an electric light or chandelier to be lowered over a library or writing table, is constructed on the principle of lazy tongs. With this contrivance it is not necessary to discard old fixtures, as the extension can be attached to the old chandelier. It sustains itself at any desired height and may be easily raised or lowered.



Extension Electric Fixture in Different Positions

QUAINT SIGN MADE FAMOUS BY CHARLES DICKENS

Over the entrance of an ironmonger's shop, as the English call a hardware store, in Blackfriars Road, London, is a quaint sign representing a dog eating out of a tilted cauldron. It is referred to by Charles Dickens in his autobiographical record. In the days when he worked in a blacking factory his usual route to and from home was marked by several things, one of which was "the image of a golden dog licking a golden pot."

The Quaint Sign of an Ironmonger's Shop in London

¶A total of nearly 800,000 acres of land in the eastern states has been purchased by the government for Federal forests.

HOW A "FAKE" PICTURE WAS MADE A REALITY

Courtesy The Sketch

A Made-Up Picture of a Cowboy Riding a Horse Slung Beneath a Balloon, and an Actual Photograph of the Real Thing

A German paper some time ago published a "made-up" picture of a mounted cowboy hanging from a balloon under the title "Col. Cody Flies Over the Lake of the Four Cantons." It was a good-natured joke on the cred-

ulous, and as such was well received by its readers. Recently, however, a motion-picture concern turned the make-believe into reality, by actually suspending a cowboy on horseback from a captive balloon over Berlin, for the purpose of a film drama.

SECURING WATER SUPPLY IN THE BERMUDAS

There are no springs or brooks in the Bermuda Islands, neither are there reservoirs or waterworks, in the modern sense, to supply houses with water for washing or drinking purposes. Wells are driven, but they yield only brackish waters, the seepage from the hills mixed with salt water that flows through the porous coral rock, rising and falling with the tide. Thus, instead of deriving their water in the usual way, each house must have its private arrangements for collecting a supply of water and of storing it away for use. This is accomplished by catching and storing the rain water. Houses are roofed over with thin slabs of native limestone and whitewashed frequently. The more pretentious residences install a rain catch with cistern attached, by means of which they are able to have plenty of water for all purposes. These rain catches are made by scraping away the thin layer of top soil on a convenient hillside and laying bare the coral rock of which the island is composed. This coral floor is cemented and whitewashed, and a low wall raised on three sides. At the foot of the sloping basin thus formed, a covered cistern is built and forms no inconspicuous part of the rural Bermuda landscape. As the rainfall in the islands is abundant, and suitable means are provided for cleaning and purifying the cisterns, the absence of wells is not noticed.

A Bermudian Rain Catch Shines White Against the Green Slope of the Hill

MECHANICAL WORK PROMOTED BY MUSIC

An interesting development in connection with the loud-speaking telephone is its use for distributing music during working hours in factories, warehouses, and other institutions where men are engaged in work of a monotonous character. It has long been known that work requiring mechanical skill without the necessity of mental concentration can be promoted by supplying the workers with some kind of pleasant amusement that will not take the attention from the work, and the loud-speaking telephone appears to make this possible on a scale not thought of heretofore. In the cigar factories of Tampa, Fla., the reading of books and periodicals to the workers during working hours has long been an established custom, and in many of the factories expert readers are employed for this purpose. The value of diversion of this kind in promoting work is also recognized in the United States navy, where the practice is to have the band play while the ship is being coaled. Amusement of this kind, however, is not to be confused with the "heave-ho" of workmen and sailors, or the monotonous chant of Japanese laborers in coaling ship, as these are designed simply to secure unison of action among the workers.

¶The metric system has been adopted in all the leading countries of the world except the United States, Great Britain, and Russia.

CHEAPER ACETONE BOON TO MOTORISTS

Acetone, a volatile spirit derived from wood distillation, is used as the vehicle in which acetylene gas is carried in order to obviate danger of explosion. Its high cost has heretofore prevented the extensive use of acetylene as a motor fuel, although calcium carbide, from which the gas is derived, may be produced cheaply wherever coal wastes and limestone are available in the same neighborhood. German inventors have succeeded in devising a process for producing acetone which should reduce the price of this commodity to one-half or even one-fourth its present quotations. It has been found that if lubricating oils used for motoring are treated with acetone certain portions of the oil are removed and the oil so treated does not give off pungent, ill-smelling gases in the exhaust of the motor. The present price of acetone, however, renders it impossible to use it for this purpose commercially.

NEW MATERIAL UNAFFECTED BY BOILING ACIDS

In the manufacture of highly concentrated nitric acid directly from the air the need of a malleable material of sufficient mechanical resistance to withstand high pressures, and immune to the action of fuming acid, has developed a new alloy called elianite. This is a product of the electric furnace and is of such extreme hardness that it cannot be worked by steel tools, corundum being used to fashion it. According to the inventor, an Italian scientist, it enters into chemical combination with but one out of every 10,000 known substances. No acid, even if boiled in a vessel of the new alloy, corrodes it.

GRAVE OF A COUPLING PIN IN RAILROAD SWITCH YARD

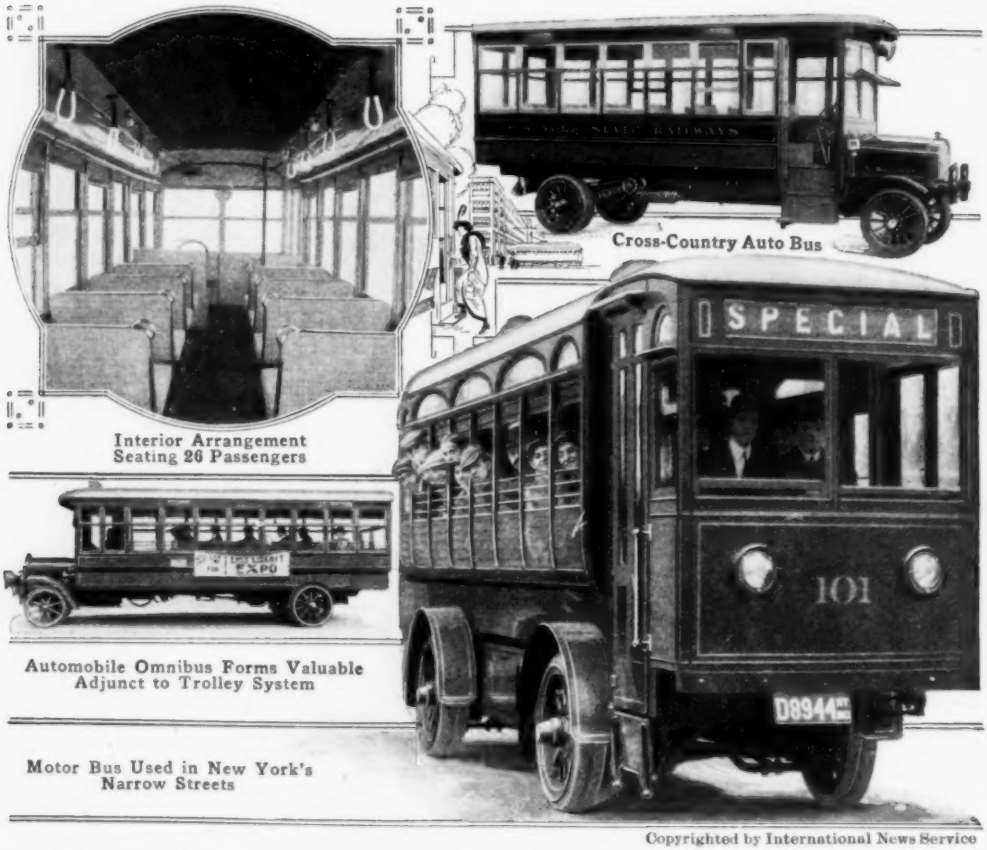
Marking the disappearance of the coupling pin and link from use in railroading, a sentimental flagman, who has spent 37 years in active service, heaped a mound of cinders beside the tracks in the freight yards of the Pennsylvania Railroad in Chicago, and placed thereon two coupling pins with a link as mementos of a strenuous past. The "grave" is outlined with white stones and upon its surface, traced in pebbles, are the words, "Old Timers—Days Gone By—Parted Forever."

Grave of the Coupling Pin

CHINESE RAILWAYS HAVE VARIETY OF GAUGES

The building of the railways of China without any regard to a national system has resulted in the use of a variety of gauges. Practically every road has been built as a local proposition, and where interests other than Chinese have been in control, these interests have insisted on following their own ideas and plans without regard to those of other roads. The Chinese as a rule have adopted the standard gauge of 4 ft. 8½ in., but several important lines are built to other gauges, the use of the meter gauge and even narrower gauges being common. In connection with the present movement to standardize the railways of China this one feature will call for enormous expenditures.

MOTOR OMNIBUS FEEDERS FOR ELECTRIC LINES



Interior Arrangement Seating 26 Passengers

Automobile Omnibus Forms Valuable Adjunct to Trolley System

Motor Bus Used in New York's Narrow Streets

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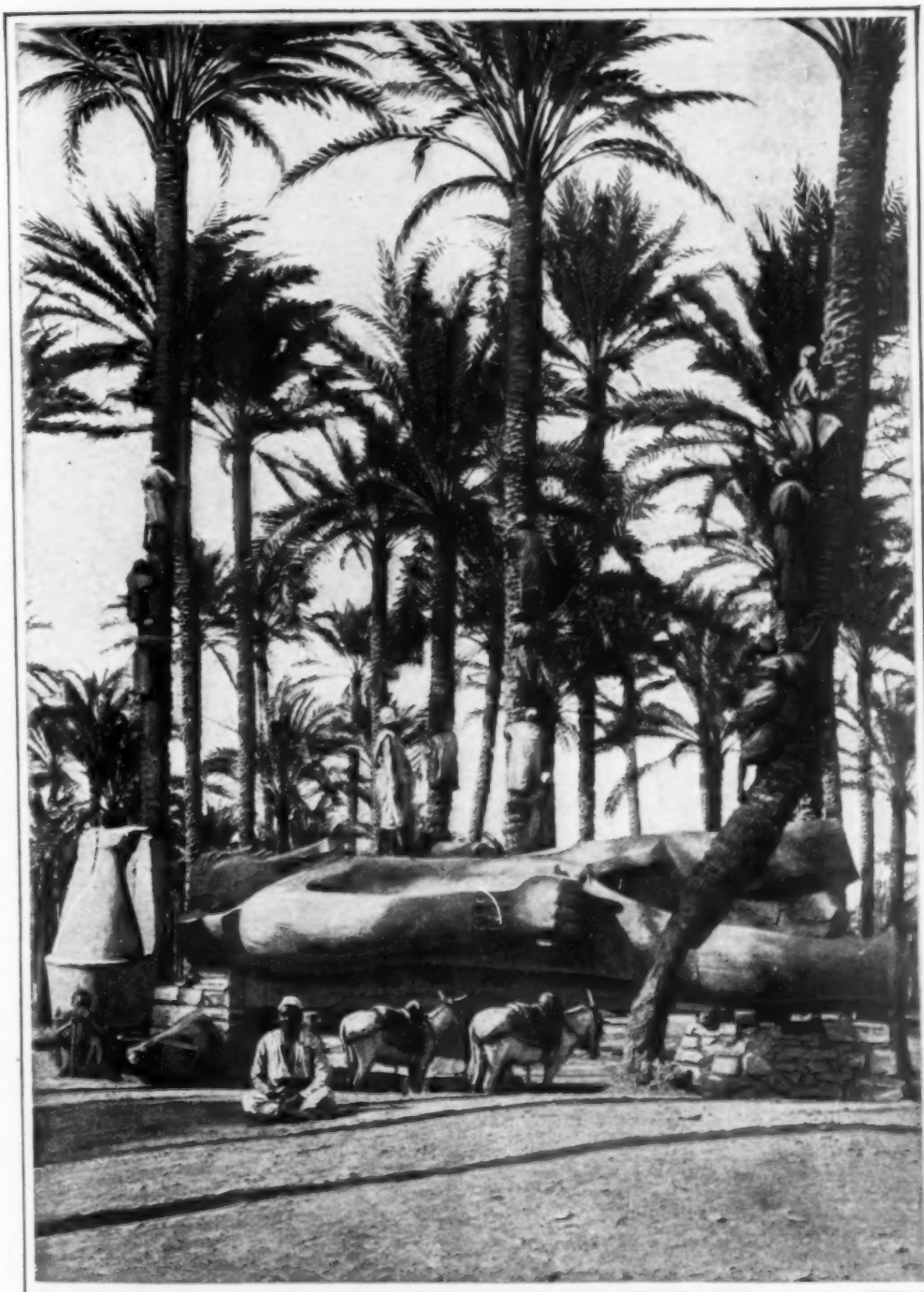
A valuable feeder for street-car lines and for interurban traffic is found in the automobile omnibus, seating from 26 to 35 passengers and furnishing accommodations for 20 more by means of sanitary hand straps. The automobile bus is in use in Pittsburgh, covering a route through the residence districts where well-paved streets are untouched by the street-car system. A longer and wider body than heretofore used gives this type a greater carrying capacity and the front opening makes for economy in operation, as it provides for "pay-as-you-enter" service with but one employe. A 26-passenger omnibus is in use by the New York State Railways, as a feeder for the trolley lines of that interurban system, running between Utica and Sauquoit, a village about 10 miles distant. Here conditions are almost ideal for the use of the motor bus, as there are a number of important manufacturing establishments in the district which are not supplied with trolley service. Good roads are found on the state highways and good running time is made. A three-ton chassis for the 26-passenger bus and a five-ton chassis for the 35-passenger bus are used. The motive power is gasoline and the lighting is electric. In New York City the street-railway company is operating a motor bus on some of the narrow east-and-west streets where it is impracticable to lay tracks and the traffic is light, transferring passengers to the regular lines.

¶For use in reforestation work, the forest service collected 40,000 lb. of tree seed last year. The total area reforested was about 30,000 acres.



The Immense Statue of Rameses II, One of the Greatest of the Egyptian Kings, is to be Brought to Cairo and Erected in the New Square by the Railway Station. This Statue Weighs over 100 Tons; Even in Its Broken Condition Far Too Great a Weight for the Older Bridges on the Egyptian Railways to Bear. It Lies in a Palm Grove near Bedrashin, Some Miles South of Cairo, and will be Brought to the City and across the Nile on Special Rails

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BRITISH LAUNCH NEW TYPE OF WAR VESSEL

The "Aurora," a light armored cruiser recently launched from a British shipyard, has been described as the smallest and fastest vessel protected by vertical armor ever built for the British navy. This vessel has a displacement of about 3,700 tons, and is about 410 ft. long. Power will be supplied by a battery of oil-burning engines of 30,000 hp., and the maximum speed is estimated at 29 knots. The armament will be light, consisting probably of six or eight 6-in. guns. It is announced that this vessel, which is the first of its class, is designed for attendance on the battle fleet, and that in addition to being adapted to scout duty it will be able to overhaul and cut down any destroyer afloat.

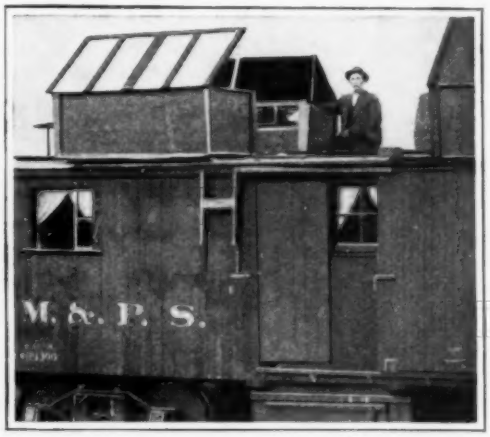
GASOLINE-ELECTRIC MOTOR COACH FOR KHEDIVE

A composite car for the private use of the Khedive of Egypt has been built by an English concern, which uses as power unit a 350-volt direct-current dynamo and a 100-volt exciter, coupled direct to a 100-hp. gasoline engine. The engine is supported upon an independent truck, pivoted so as to permit vertical motion, but is contained within the steel framework of the car. Compressed air is used to start the engine, a storage reservoir being used. The outside of the coach is faced with steel plates, painted ivory-white and lined with gold.

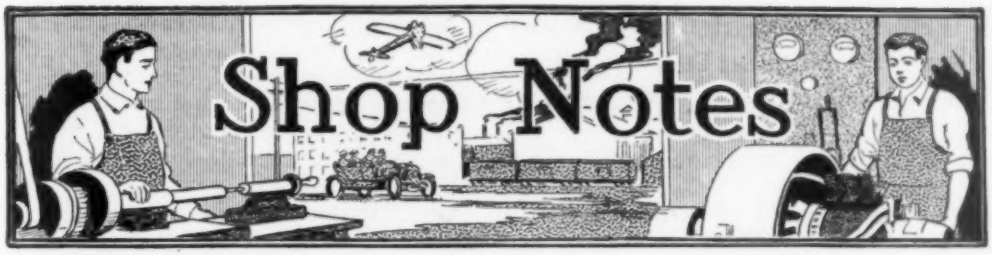
One of the New Self-Propelled Cars Made for the Khedive

POULTRY HOUSE ON TOP OF BOX CAR

Coops containing dozens of fine chickens arranged on the top of a box car is a bridge foreman's idea of sticking close to one's hobby. The birds are prize winners, and their constant trips about the road interfere neither with their health nor happiness, so far as their owner can discover. The owner is an employe of one of the great western railroads and his position as bridge foreman keeps him constantly engaged in constructing or repairing the bridges on his division. Caring for the fowls is his recreation and pastime.



Chicken Fancier Takes Prize Fowls with Him While Repairing Bridges



Grinding Piston Rings

The base of the casting from which the piston rings are cut is left on the faceplate of the lathe and bored out to snugly receive the piston. On new work the piston should be turned to $\frac{1}{64}$ in. oversize. The bored-out base is used as a gauge in cutting the rings, after the edges have been ground to fit the ring grooves in the piston. After cutting them, they are placed in the piston in the usual manner.

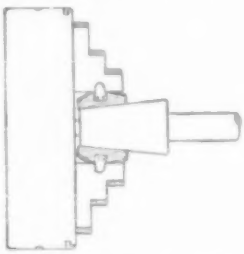
Provide as many sheet-metal strips as there are rings, each about ¼ in. wider than the ring and not over $\frac{1}{64}$ in. in thickness. Bend these around the piston and turn the ends out at right angles so that there will be a gap of about ½ in. Drill or punch holes in the projecting ends for a small stove, or other, bolt. The clamp end with bolt is shown in the sketch.

Procure some engraver's wax, which is made of resin, beeswax and a little shellac. Heat the pistons in an oven until hot enough to melt the wax. Melt the wax in a ladle and pour it in the cut in the ring until the space is well filled, then slip on a clamp with the bolt over the cut in the ring and well centered. Draw up the clamp, squeezing out the surplus wax until the ends of the ring are close together. The clamps, being of thin metal, allow the rings to take their own shape and also center them in the piston groove. All rings are treated in the same manner, then the piston is set aside to cool.

When the wax is set, remove the clamps, then wipe off the surplus wax with a rag soaked in gasoline. Center the piston in a lathe and grind both piston and rings to snugly fit the bore of the cylinder, which should also be ground to size. Place the piston in a pan, return it to the oven and heat sufficiently to remove the wax, then set it in gasoline for 48 hours to clean it thoroughly of the wax. If it is desired to remove all clinging wax quickly, boil it in soda water. In this manner the rings can be fitted accurately, so that their entire surface will be in contact with the cylinder walls.—Contributed by S. A. Asquith, Waterloo, Ia.

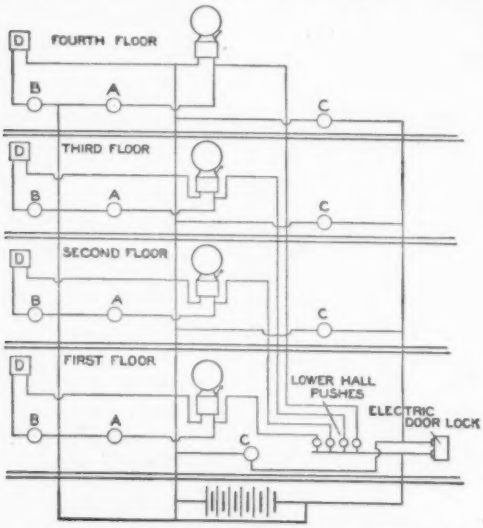
An Auxiliary Chuck Jaw

The illustration shows an auxiliary jaw which sometimes is very handy for use in a lathe chuck. The jaws should be made of soft brass or copper so that they will not mar the piece gripped in them. Make them about three-quarters the length of the regular chuck jaws. If the regular chuck jaw is 1 in. wide, make the auxiliary jaws .005 in. smaller. Fasten a small spring, or clip, on each side of the jaws. These serve to hold the auxiliary on the chuck jaw while placing the work in the chuck. As will be seen, the back of the jaws are convex or rounding. This allows the auxiliary jaws to conform to odd-shaped pieces or tapers. The illustration shows the jaws gripping a taper shank.—Contributed by Chas. Homewood, Waterloo, Iowa.



Bell and Door-Lock Circuit for an Apartment House

The accompanying diagram shows the method of wiring the front and back-door bells and the electric lock



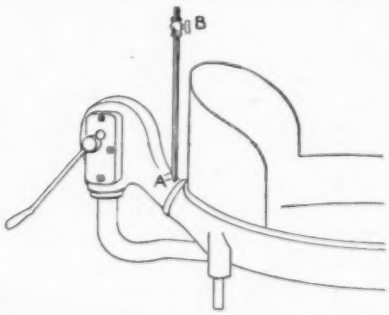
Complete Electrical Circuit for the Front and Back-Door Bells and the Electric Lock

on the front door. Four separate push buttons are located in the lower hallway and connected so as to ring the bells in the different apartments. These buttons are usually mounted on the mail boxes and near the mouthpieces of the speaking tubes, which are also, as a rule, mounted on the mail boxes. Another button is often added to operate a bell in the janitor's quarters. The push buttons marked A are mounted on the side of the doors entering the flats from the front hallway. These push buttons, of course, operate the same bells as the push buttons in the lower hallway. Buzzers or bells, D, of different tones than those in the front of the apartments are wired to be operated by push buttons, B, located at the back doors. Push buttons, C, are located near the mouthpiece of the speaking tubes leading to the vestibule or entrance which control the electric door lock. These circuits can be elaborated to meet almost any requirements. The wires used should be well insulated and installed in such a manner that there is little likelihood of shorts or grounds occurring on any of the circuits. A small bell-ringing transformer may be used in place of the battery, thus doing away with the trouble due to exhausted batteries and the cost of renewing same. It is always best, if possible, to make all splices and branch connections at a push button or bell, as this often reduces complications in testing out the circuits and locating causes of trouble.

Starting a Forge Fire

If a forge fire is used only occasionally, the starting of a fire requires considerable time, but where gas is available the fire may be hastened by equipping the blower with a gas-supply pipe, as shown.

The pipe leading from the blower to the tuyère is drilled and tapped for a ⅜-in. pipe at any convenient location, as at A, and connected to a gas line. A valve, B, is located in the gas line where it will be handy for the operator.



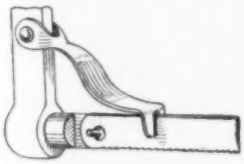
The Burning Gas Starts the Coal Fire and Leaves No Harmful Residue in the Forge

All that is required to start the fire is to lay a lighted match on top of the coal in the forge, turn on the gas lightly and turn the blower, slowly at first, and then gauge the gas and air to the proper mixture. The coal will be ignited and burning at a welding heat in a short time.—Contributed by Earl Pagett, Coffeyville, Kans.

¶A piece of paper placed between finished metal surfaces keeps them from sliding.

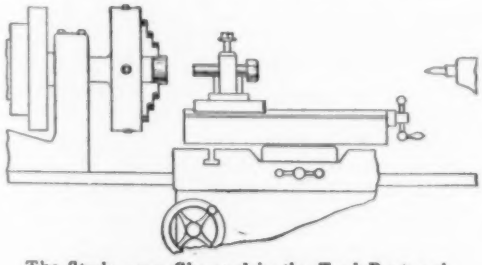
Thumb Rest for a Hacksaw Frame

In using a hacksaw for a considerable length of time, I found that the pressure applied with the thumb of the left hand resulted in a blister or the breaking of the skin. To overcome this difficulty I made and attached the thumb rest shown in the sketch. The rest consists of sheet metal thick enough not to bend under the pressure, and is cut and hinged to the front end of the hacksaw frame so that, in use, it lies on the back of the blade. This makes a thumb rest and also stiffens the saw blade.—Contributed by Chas. Walte.



Threading Studs in a Lathe with a Solid Die

Having occasion to hurriedly thread quite a number of small studs when no bolt cutter was at hand, and the usual stock and die being an unwieldy affair for this kind of work, I accomplished the threading quickly in the following manner. There was a small lathe in the shop and the die was centered in the jaws of the chuck. The studs were of a size that easily passed through the tool slot in the post, and were tightened down by the holding screw. A few shims were laid in the slot to line the studs with the center of the die, and it was a quick piece of work to thread them by simply starting the lathe to cut the threads.—Contributed by F. W. Bently, Jr.



The Studs were Clamped in the Tool Post and Threaded in a Die Held in the Chuck

Obtaining the Relative Intensity of Two Sources of Light

The following simple device may be used in determining the relative intensity of two sources of light, or measuring what is called the candlepower of one lamp in terms of the candlepower of another lamp which is known. The operation of the device depends entirely upon what is known as the law of inverse squares, which may be illustrated as follows:

Take a point source of light, such as A, Fig. 1, and consider the illumination on surfaces located different distances from this source. It is quite obvious that the illumination on a given area decreases as the distance between the area and source of light increases, and it can be shown that there is a definite relation between the illumination on a given area and the distance between the area and the source of light. If an area, B, be located a distance, C, from the source of light A, and lines be drawn from the source of light through the four corners of the area B, a pyramid will be formed. A certain quantity of light will be contained in this pyramid and it will be distributed over the area B. If a second area be taken at twice the distance—2C—from the source of light, it will be four times that of B, but the same quantity of light will be distributed over this new area that was distributed over the area B. A third area may be considered at a distance of 3C from the source of

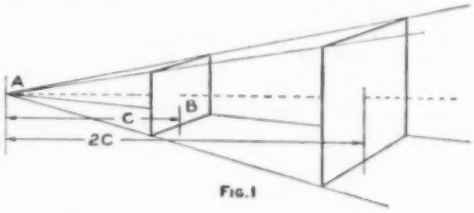


FIG. 1

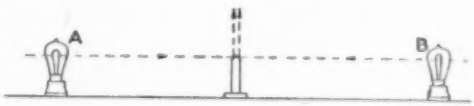


FIG. 2

Illustrating the Law of Inverse Squares, and a Simple Photometer

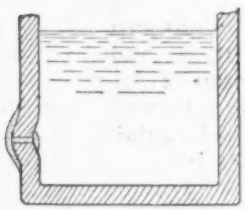
light, and it will have an area nine times that of B, and the same quantity of light will be distributed over it as was distributed over the first and second areas. Other areas may be taken at less, intermediate, or greater distances than those just given, but they will be related to each other as the square of their respective distances from the source of light. Now, since the same quantity of light falls on each of these areas, the quantity per unit area must decrease as the areas increase, or the light per unit area varies inversely as the square of the distance the area is from the source of light. If, then, two sources of light be placed a given distance apart, as shown in Fig. 2, there will be some point between them where the illumination from each source is the same. This point may be located with a fair degree of accuracy as follows:

A block of wood, about 1 in. square and several inches long, is cut V-shaped at one end so that the surfaces thus formed will be at right angles to each other. Cover these two surfaces with pieces of pure-white drawing paper. The edges of the pieces of paper should be beveled where they join. Now, by moving this block so that the surfaces move on a line joining the two sources of light, and at the same time observing the relative illumination on the two surfaces, a point may be located where the two surfaces will be equally illuminated. If the total distance between the two light sources A and B is 100 in. and the source of light A is 40 in. from the wedge and the source of light B, 60 in. from it, when a balance is obtained, the light obtained from A on one of the white surfaces will be equal to $\frac{A}{40^2}$, and that from B, on the other, equal to $\frac{B}{60^2}$. These two values being equal, it is easily found that, in this case, the intensity of the light source A is four-ninths that of B, so that when the candlepower of one of these sources is known, the candlepower of the other source is easily computed.

Better results can be obtained by using a screen of some kind to cut out all the light from the observer's vision except that coming from the two paper surfaces. The surfaces of the wood block as well as the base on which it slides, should be given a coat of dull black paint. A number of balances should be obtained by moving the wedge in the opposite directions, and the average taken as a final value.

Repairing a Leak in a Heating Boiler

A heating boiler sprung a leak at a time when it was most needed. The boiler was of the sectional type, the sections arching over the fire box and carrying the water. To remove one section would have made it necessary to take the whole boiler apart to repair it. This would have required a week or more, during which business would have been suspended unless the weather moderated. The leak was seemingly caused by corrosion in the pocket where the core had been supported by a wire when cast. The corrosion made the casting at what is usually a weak spot very thin, and finally a small pinhole was blown through. When over 2 or 3 lb. of steam was carried the increased heat caused greater expansion, and the hole was so enlarged as to let a good stream of water through on the fire. The location was too confined to permit drilling or plugging by any ordinary methods. It was then suggested to try a plug of softer material. The hole was enlarged, by pricking it, and filled with asbestos, but this would not hold when under pressure. Fireclay was then mixed and enough forced in to fill two holes of like diameter, and the outside well smeared over. This repair was entirely successful.—Contributed by Donald A. Hampson, Middletown, N. Y.



Filler for Patterns

Cracks, holes, corners and irregularities in wood patterns must be filled up before the patterns are in shape for the foundry. Beeswax, plaster of Paris, paraffin, etc., are used for this purpose, but a better substance is metal filler that is sold in paste form for smoothing castings. The color of the paste is the same as that given to most patterns. The paste is applied after putting on a coat of shellac. It is rubbed in with the fingers after dipping them into water. When all the holes have been filled and the filler has partly dried apply another coat of shellac, and a good surface will be the result. This is not a substitute for a filler in corners of patterns requiring a definite radius; it is only a filler for holes and depressions.

Auxiliary Drill Chucks for a Jeweler's Lathe

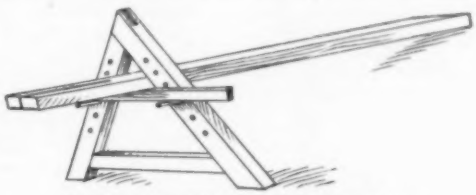
The chuck on my dentist's lathe would not hold smaller drills than the size of the hole in the chuck satisfactorily, and I proceeded to make auxiliary jaws for the drill sizes, each having an outside diameter of $\frac{5}{32}$ in., the size of the hole in the lathe chuck. These were made of wire nails, $\frac{5}{32}$ in. in diameter. The heads and points were cut off and the squared ends, thus made, were centered accurately. A hole, A, was drilled through the center, to admit the drill used in drilling the hole. One end of the piece was then cross-slotted, as shown at B, with a small saw, thus making a small holder to fit the lathe chuck.

Each Small Drill was Supplied with a Chuck to Fit the Lathe Chuck

After using the auxiliary chuck a few times it would cling tightly to the drill and, in a manner, make a drill shank of the size for the lathe chuck. It would also prevent very small drills from being lost. Each of the small drills was supplied with a chuck of its own.—Contributed by L. L. Llewellyn.

Sawhorse for Heavy Timbers

When it is necessary to saw a heavy board lengthwise and no bench is at hand, the job can be easily done by the aid of the simple device shown herewith, the construction of which is self-evident. The board is clamped in the upper angle of the A-shaped horse by means of the movable crossbar which is held in position by pins, as shown. By allowing the larger end of the board to drop to the ground, it is held very rigidly for sawing. When sawed through about halfway, the split end is pushed out and the other end sawed.



A Horse for Holding a Heavy Timber While Ripping It with a Handsaw

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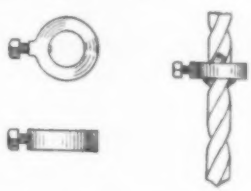
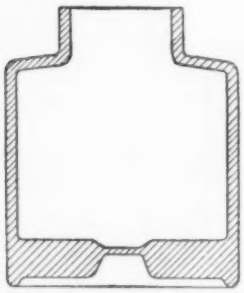
Counterbore Attachment for a Twist Drill

The attachment can be used on a twist drill for countersinking the hole when it is drilled through the metal, or be set to make the countersink when the drill reaches a certain depth. The attachment is made of a piece of cold-rolled steel, drilled through its center larger than the drill upon which it is to be applied. Two pieces of tool steel are ground to fit the flutes on the drill and of sufficient thickness to form cutters for the size of the countersink. The cold-rolled steel can be shaped as desired, but it is always best to have a piece large enough so that a flush screw can be used for safety. The attachment can be set on the drill at any point desired and used as a stop.—Contributed by Chas. G. England, Washington, Pa.



Making Holes in Glass Bottles

A firm of chemists preparing a certain lotion for bruises and sprains decided that its sale and field of usefulness would be increased if the preparation were put up in a bottle having a hole through the bottom. The purpose of the hole is not important, but the manner of making it may aid some other workman, having similar work to do. The hole, of course, was to be corked after filling the bottle. The size of the hole was not essential, but it was found impossible for the bottle makers to blow the hole in the bottom.



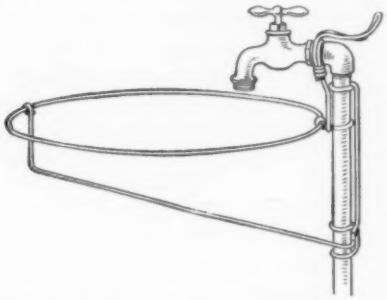
The bottom of the bottle was 3/8 in. thick and, in submitting an estimate on drilling the holes, I placed the cost at 5 cents for each bottle. As the bottle only cost 2 cents, this method was too expensive, and I suggested a plan which the chemists adopted.

The molds for the bottles were altered slightly by the addition of parts that would form a recess in the bottom, as shown in the sketch. This left a thin web of glass at the bottom of the recess, or depression, and added nothing to the cost of the bottle. A boy was put to work with a punch and hammer to knock the web out of the bottom. Only a few bottles were broken, so that the added cost was very small. The break was irregular, but this was of no consequence. The surrounding wall was so heavy in comparison with the web that the glass gave away without any trouble.—Contributed by Donald A. Hampson, Middletown, N. Y.

¶The most convenient way of hanging plans, bills of material, or other papers, in the shop is to make a small hole in one of the upper ends of an ordinary spring clothespin and hang it on a brad.

A Hydrant Cup and Basin Holder

The yards about a shop, factory, or boarding house usually have an ordinary hydrant where water is obtained



A Basin and Cup Holder Made of Wire and Attached to a Yard Hydrant Pipe

for drinking and washing purposes. As a rule, the basin is filled and carried to a resting place on some box or barrel. The attachment shown holds both basin and cup. The basin can be filled and then turned to the rear or side, as desired, while others obtain water. Two pieces of heavy wire, preferably copper, is all the material necessary, and the sketch clearly shows how it is applied.

Prick Punch with Hammer

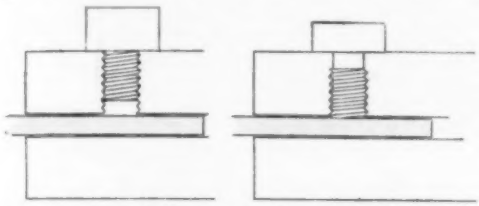
The prick punch made as shown does not require the use of a hammer. The punch is turned from tool steel and a steel ball is drilled centrally to fit on the handle part. The upper end of the handle is threaded to receive a cap to hold the ball in place. The point of the punch is properly hardened. To

The Ball on the Handle is Used for Driving the Point of the Punch into the Metal

use, place the point on the spot and raise the ball to the upper end of the handle; then it is brought down quickly to strike the flange at the lower part, which forces the point into the metal. —Contributed by Abner B. Shaw, No. Dartmouth, Mass.

To Lengthen a Short Cap Screw

Finding the cap screw in a socket just a little too short to clamp the spindle and not having a longer one of the same size, I filed away a portion of the bottom of the head, removing a part of the body below the threads as



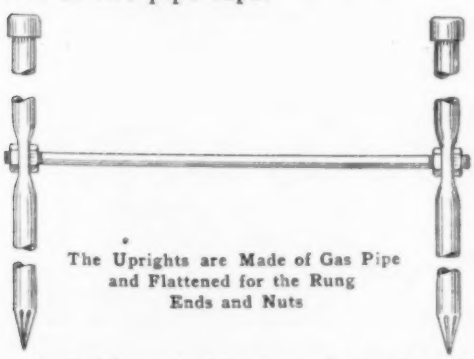
The Extra Length for the Screw was Made by Cutting Away Part of the Head

shown. This made enough extra length to clamp the spindle tightly.—Contributed by James M. Kane, Doylestown, Pa.

Shop Ladder Made of Pipe

A small ladder is a handy article about a shop, but the uses to which shop ladders are sometimes subjected are too severe on most wood ladders.

The sketch shows a light, durable and strong ladder made of pipe. At each point where a rung is to be located, the pipe is flattened to allow a long ⅝-in., or ¾-in., stud to pass through and be secured at each end by two nuts. The lower ends of the ladder are drawn to a point to prevent its slipping. The upper ends are improved in appearance by the application of two pipe caps.

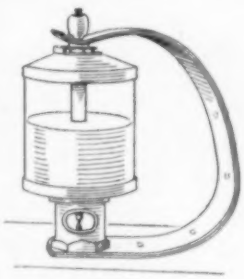


The Uprights are Made of Gas Pipe and Flattened for the Rung Ends and Nuts

A ladder of this type is both valuable and durable and its uses are almost innumerable.

Automatic Feed for an Oil Cup

Hand-adjusted oil cups very often become clogged with particles of dirt, which results in a hot bearing or a damaged shaft, if not watched closely. The cup illustrated is hand-adjusted when starting the machine, but later the feed is operated automatically by a thermostat spring, if the bearing begins to heat up a trifle.



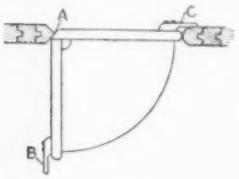
The cup is similar to the ordinary sight-feed kind with the needle valve operated by a thermostat spring. The spring consists of two pieces, one brass, 16 gauge, and one steel, 20 gauge, bent as shown, then drilled for rivets and the holes countersunk. The brass piece is placed on the inside of the bend and both pieces are riveted together solidly. If any substance clogs the opening at the point of the needle, the bearing will begin to warm up, which will cause the spring to raise the valve and let the oil rush through. It works automatically without attention when set.—Contributed by Louis Stankewitz, New York City.

A Flat Water Paint

To make a good flat water paint, take 50 lb. of gilders' bolted whiting, place it in a tub and pour water over it until the mass is covered. Allow this to stand several hours, say, over night, then pour off the excess water and add 2 gal. of hard oil finish—gloss or resin oil will do—and any desired color, then beat up the mass until it is perfectly smooth. Use water color or dry color, not oil color. Thin the mass down to a brushing consistency with turpentine, benzol or benzine, and it is ready for use. This will make a very nice, flat, lusterless finish as good as the much advertised water paints of the same character.

Swinging Telephone Shelf for Two Rooms

Quite often two persons occupying adjoining offices wish to make use of the same telephone. If the partition dividing the two offices be a thin wooden one this can be accomplished very easily by making use of a swinging shelf similar to that shown in the accompanying illustration.

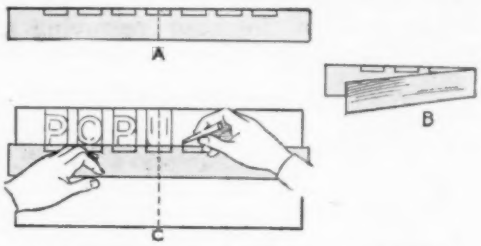


A small opening, of sufficient size to accommodate the telephone, is cut in the partition so as to place the telephone as near the desks on opposite sides of the partition as possible. The edges of this opening should be shaped as shown in the sketch. The shelf proper is in the form of a quadrant of a circle whose radius is a little less than the breadth of the opening in the partition. Two sides are attached to the shelf as shown, and are of such size and shape that they will just fit into the opening when their common edge is beveled off at a 45-deg. angle. The shelf may be supported by double hinges, A, attached to the beveled edge. Two stops, B and C, should be provided to prevent the shelf from swinging too far through the opening or past its proper position. These stops may be so shaped that they will serve as handles in moving the shelf. The edges of the opening may be covered with heavy felt, which will serve to close any crack that might otherwise exist. A small piece of quarter-round is shown fastened in the corner between the two sides to give a good anchorage for the screws holding the hinges. The cord leading to the telephone should pass through a hole in the back corner of the shelf.

¶A painter's brush having reasonably stiff bristles is much better for dusting heavily carved furniture than the ordinary feather duster.

Spacing Letters on a Sign

Frequently it is a more difficult task to space letters properly than to write them on a sign. I often find it convenient to first lay out the letter spaces on a strip of paper, A, double it as shown at B, and then lay the crease on the center line of the design. The spaces are then easily and correctly laid out on the sign C, without spotting the surface with trial marks.—Contributed by James M. Kane, Doylestown, Pa.



The Letters are First Spaced on Paper Which is Creased to Show the Center Line

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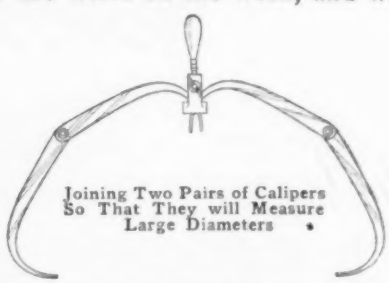
Enlarging the Capacity of Calipers

It is not an uncommon occurrence in the routine of general lathe work, to come across some work with a diameter too great to be measured with the largest pair of calipers in the tool kit. The sketch shows how to fasten two pairs of calipers together with a hand vise to increase their reach for measuring large diameters. The hinges on both pairs of calipers can be brought into use while on the work, and when rigidly clamped together by means of a small hand vise, the arrangement is as practical as a large, heavy pair of calipers. The adjustment is made with the two extending arms.



Joining Two Pairs of Calipers So That They will Measure Large Diameters

Practical Telephony

By HAROLD HINTON

Part XII—Trouble Hints

A few general directions for locating trouble in telephone work will be given in this concluding part, but they will be only such as to give the workman an idea of what to do, as hints of this kind, to cover all troubles, would require considerable space and many of them would be put in practice only occasionally.

A solid-back transmitter has practically no adjustment. If the carbon should become packed together, the trouble can be remedied by tapping gently upon the top or side of the case. This will jar the caking loose and separate the particles. All connections in the primary circuit as well as in the battery should be kept in perfect condition.

A receiver whose magnets are too weak to support an 8-oz. weight should be condemned, and the diaphragm adjusted to within .015 in. of the magnet. All bent or corroded diaphragms should be replaced.

All bell screws must be kept tight and firm, and all dust or corrosion removed from the hook connection. The wire connections of bells should be securely fastened and contact points well soldered.

Examine cords frequently to discover breaks.

Exhausted dry batteries should be replaced, but they may be restored in emergency cases, for temporary use, by perforating the bottom and standing them in a sal-ammoniac solution.

Ground-wire connections should never be permitted to corrode. When testing to establish the condition of the ground wire no result should be taken for granted until the full talking efficiency of the instrument has been obtained.

All unworkmanlike inside wiring should be brought to standard when repairing, such as two wires under one staple, sagging wires, soldered connections to line wires, wires which run in places where they may be exposed to damage.

Magneto Troubles

If two magneto bells or drops ring together, look for a cross of office or line wires. If a common return wire is used, the return wire may be broken or the drop ground is broken. By opening one line at the central office and ringing out on the other line the trouble can be located. If both bells ring, the lines are crossed, but if neither bell rings, the common return will be found broken. If the trouble is with the drops, the line at one subscriber's station should be opened and the other one rung. If both drops fall, the line is crossed; if neither falls, the drop ground will be found broken.

If a magneto bell rings frequently from no apparent cause, it indicates a swinging cross with telegraph or other lines.

If a bell can receive a ring, but cannot ring out, it shows that a wire is broken either in the line or office; that a protector is open; line is grounded, if bridged to ground, or short-circuited, if bridged to metallic line. By tapping on the transmitter and listening on the line little or no sound will be heard, if the line or protector are open. If the line is short-circuited or grounded, the transmitter will give a loud sound.

If the bell rings, but no response can be obtained, the trouble is usually a grounded or open line, or burned-out protector, if bridged.

If a magneto bell receives a ring, but cannot ring its own bell, it indicates a broken wire or connection in the generator or a conducting wire from it; the armature does not make contact with the spring if bridging; the coils are short-circuited, or the current cannot get to the line because the shunt will not open.

If a magneto bell receives and transmits a ring, but no talking can be heard, it indicates a broken receiver cord, weak battery, bad connections, or the hook does not go up to place. A weak spring or a hook which does not move easily will cause the latter trouble and the talking instruments will not be connected to the line.

If a magneto bell receives a strong ring itself, but rings other bells feebly, it indicates generator trouble, usually due to bad connections, but sometimes caused by weakness of the permanent magnets of the generator.

If the magneto bell rings other bells vigorously and its own bells weakly or not at all, the trouble will usually be found to be poor adjustment of the armature or weakness of the ringing magnet.

If the magneto bell will not ring at all, look for a burned-out protector; a broken wire in box, or broken line, or ground wire.

If the magneto bell rings feebly, but talking can be heard plainly over the wire, look for a poor connection inside the box.

If a call is made on a toll or party line and no response is obtained, test out the trouble as for a bell that receives a ring but cannot ring out.

If toll or party-line bell rings, but no talking can be heard, treat trouble as where a bell receives and transmits a ring, but talking cannot be heard.

If a ring is received on a four-party selective system, but talking cannot be heard, test for an open line.

Battery Trouble

If transmission of speech is feeble, but is received normally, the trouble is usually due to a weak battery. The test for a weak battery is to listen in the receiver, tapping at the same time on the transmitter or mouthpiece with the finger. Do not tap on the diaphragm. The sound will be loud and clear if battery is in good order, but little or no sound will be heard if battery is weak.

If a singing or sputtering sound is heard in a telephone, a few taps on the transmitter or mouthpiece will sometimes remedy it, but a scratching sound is usually due to a broken wire in the flexible cord making an imperfect and irregular contact.

Examine the battery connections often so that perfect contact may be maintained at all times, and oxidization, or other foreign matter, which may accumulate at these points, can be removed.

Common Battery

If speech is not distinct and is accompanied by a grating or scratching sound, look over the transmitter circuit in the transmitter terminals and at the induction coil.

If a call is made and no answer can be obtained, the trouble may be laid to any of the following causes:

1. The subscriber's relay in the central office may not work on account of the line circuit of the relay being open or short-circuited on terminals or in coils, or from poor contacts existing in the local circuit because of improper adjustment of relay-line circuit.

2. A burned-out lamp may be the cause.

3. The coil of an electromagnetic circuit may be open or short-circuited in terminals or coil; armature may be stuck or imperfectly adjusted.

4. The trouble may also be caused by an open circuit, a ground or short circuit in protectors, on the line or in the subscriber's condensers.

5. A permanent signal showing at the central office indicates a ground or short circuit.

If the bell receives a ring, but speech is impossible, the trouble is usually due to the repeating coil in the central office being open; the springs of the ringing keys not making connection with the back contact; a broken wire, blown-out fuse or burned-out coil. The subscriber's receiver, transmitter or winding of the induction coil may be open.

If a ring cannot be received, it indicates an open, short circuit, or ground in instrument, line, or office wire. The trouble may also be caused

by an armature being out of adjustment or a ringer magnet being weak. Burned-out ringer coils, or a broken line wire, or condenser circuit may cause the open, while a short circuit or ground will cause a permanent signal to show in the central office.

If a receiver is weak, reverse the receiver cord.

If speech can be heard, but conversation cannot be effected, the trouble may be due to a broken wire between the transmitter and induction coil; transmitter may be short-circuited; transmitter cord may be broken; or a secondary induction-coil winding may be short-circuited.

If the central office signal is weak, the cause may be assigned to a bad contact in relay causing high resistance in local circuit, or insufficiency of main batteries, or too small power leads.

If the central office signal will not act, it is due to an open line, broken local circuit, improper relay adjustment or insufficiency of battery.

If speech is indistinct and accompanied by a grating or sputtering noise, the line is crossed, or there is a loose connection in the line circuit. A signal showing in the central office indicates a cross in line. Loose connections in this case may be due to poor contact in protectors; in hook switch; in spring jacks; defective switchboard cord or defects in office or line-wire connections.

Pole Lines

The easiest way, and incidentally the proper way, to keep clear of trouble on pole lines is systematic inspection of every pole, cross arm and fixture, as well as all wires and cables attached to them.

It may be interesting to note that the life of a pole in the average toll line is from 8 to 10 years while the life of a subscriber's line pole is from 15 to 20 years. This difference is due to the fact that toll-line poles are usually set where there is more or less vegetation, whereas the subscriber's poles are usually located in places which are comparatively free from vegetation.

The butt of the pole, from the ground line down, should be carefully watched, as when it once starts to decay, it is a comparatively short time before the pole is rotted off. A screwdriver, or other semipointed tool, is good for testing pole butts, cross arms, etc. Simply drive it into the wood by a sharp blow, also being sure to test the ends of the cross arms.

Pole-line inspection and maintenance, under ordinary conditions, require the services of a lineman, a ground man, and a horse and wagon. This crew can cover considerable territory and keep the average rural line in good condition by testing and replacing defective poles, cross arms, etc.; keeping all guys, etc., up taut; stringing new wire in place of wire that is in a defective condition.

This pole-inspection crew also shoots trouble on their line and must understand inside wiring as well in order to successfully cope with trouble arising from defective interior work, and for that reason a few pointers will be found valuable.

The line, or outside wire, should be run as near as possible to the location of the instrument in order to keep the inside wiring as short as possible.

The hole in the window or door frame, through which the wires are run into the house, should have a slight pitch downward on the outside end. This is to prevent the entrance of water and snow.

Lead wires should always be soldered to the ends of the line wires.

All wires entering the building should pass through separate holes, 2½ in. apart, and should be run through tubing or taped at these points.

Use No. 19 twisted-pair, rubber-covered wire from the instrument to the arrester, and fasten it securely in place with insulated staples.

The outside wires cause the most trouble from crosses and shorts, while the inside wiring is responsible for a great many cases of grounds.

Crosses are usually found outdoors, where the wires are unprotected by insulation, and may be caused by a piece of baling wire, or other metal, being thrown across the line wires, and by wires being too slack and swinging against each other in the wind.

Ground wires are a continual source of trouble on rural lines. This is the wire which runs to earth at each end of the line, so that the ground can complete the rest of the circuit, removing the necessity of running two wires for each circuit. Dry earth, sand, gravel, etc., are not good conductors, so that, to obtain the best results, the ground wires must lead to damp earth, and the wires should extend down below the point where the earth becomes dry in summer or freezes in winter. Dry ice itself is a material of high insulating qualities so that a ground wire is totally useless in frozen earth.

There are two ways of making perfect ground connections; the first is to use a ground rod and drive it well down into the soil. The top is then scraped bright and a piece of clean tinfoil wrapped around the rod. The cleaned ground wire is wrapped over the foil, another layer of foil is wrapped over the wire, and a couple of layers of friction tape are put on over the whole.

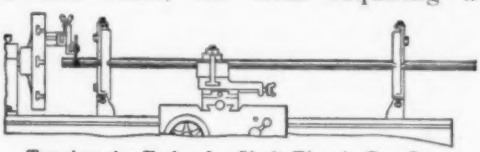
The best, most satisfactory and most economical ground connection is made by attaching the ground wires to a gas pipe or, better still, to a water pipe by the aid of a clamp. Care should be taken to connect the ground wire outside of the meter so that, if the meter is removed for any reason, the phone will not be put out of commission.

A common return wire is often resorted to, to avoid the noisy effects of induction caused by electric-railway and electric-light currents. This common return wire consists of the grounded lines on certain routes being carried back and grounded at the central office by a common return wire to which they are all connected. A separate copper return wire must be provided for each route, and the insulation and connection of the return wire should be perfect. The gauge of the wire should also be heavy enough to dispose of the business of the subscribers' lines and avoid cross talk.

After a thunderstorm an "open" line may be due to a burned-out arrester fuse, or a wire burned off in the annunciator, or in the ringing coils of the magneto bell. If small particles of carbon should lodge between the carbons in the arrester, it will cause the line to ground. The principal cases of trouble have been outlined in this part and anyone with a mechanical turn of mind should have no difficulty in tracing out, by a little persistent effort and experiment, nearly any case of trouble which may arise.

Machining Long Shafts in a Short Lathe

Every mechanic is familiar with the problem of handling some jobs too large for the machine, but many times work is sent out for the reason that no one knows just how to do it quickly with tools seemingly inadequate for the occasion. For example, in one small shop a piece of 3-in. cold-rolled steel, 30 ft. long, had to be machined for a line shaft, the ends requiring a



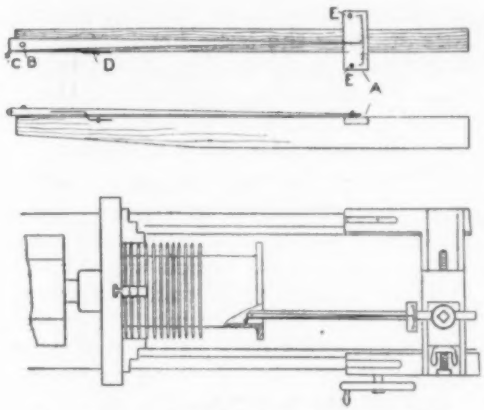
Turning the Ends of a Shaft That is Too Long for the Bed of a Lathe

smaller diameter to fit into the coupling. This was accomplished as follows: One end of the shaft was gripped in a chuck, one steady rest placed near the chuck and another at the end of the lathe bed. The steady rests were set to center the shaft perfectly true and in line. The shaft was then loosened from the chuck and fastened to the crosshead.

Remove the lathe chuck, substitute a large faceplate and attach a small compound rest, as shown. In this manner the cutting tool travels around the shaft while the latter is fed by the lathe carriage.

An Emergency Indicator

The regrinding of an air-cooled cylinder made it necessary to chuck it accurately, and as I had no indicator, a temporary tool was made of wood.



This Homemade Tool will Indicate Any Slight Setting Out of True

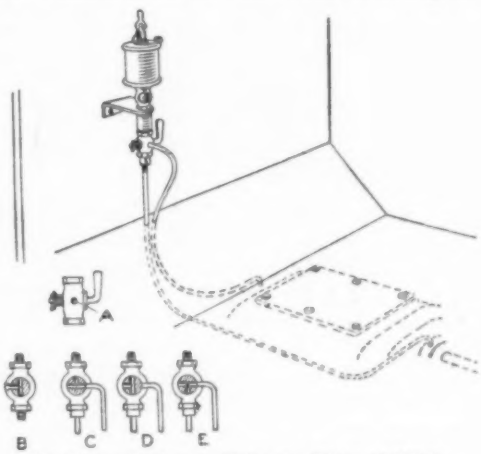
The main beam, or pointer support, was made of white pine, $\frac{5}{8}$ in. thick, $1\frac{1}{2}$ in. wide, and 1 ft. long. One end was tapered, as shown, for the sake of appearance. The pointer was made of another piece of white pine, $\frac{3}{16}$ in. thick, $\frac{5}{16}$ in. wide at one end, and tapered to a point at the other, the length being 9 in. A groove was cut in the upper edge, at A, and a piece of wood inserted for a graduated scale. The pointer was pivoted $\frac{1}{4}$ in. from the end, at B, to the beam, and a small pin inserted, at C, on an angle, as shown. The pointer should swing freely. A small spring was made of spring wire and fastened with staples, at D, to apply pressure on the pointer. Two small pins, EE, were placed in the scale, to keep the pointer from swinging too far either way.

The indicator in use is shown in the sketch. The shank of the beam is placed in the tool post of the lathe, and the pin at the end of the pointer is run against the bore of the cylinder. Any small deviation out of center will show by a slight movement of the pointer on the scale.—Contributed by Joe V. Romig, Allentown, Pa.

Oiling System for Main-Shaft Bearings of an Automobile

The main-shaft bearings on my automobile were not oiled sufficiently by the wick oilers, and I supplied an oiling system as shown in the sketch. An ordinary sight-feed oiler was attached to the dash with a bracket, made of No. 16 gauge sheet brass. The oiler was clamped in place on the bracket by turning a pipe coupling on the threads after they were run through the hole in the bracket. The valve controlling the flow of oil was screwed into the coupling and the pipe lines were made of $\frac{1}{8}$-in. brass tubing.

As I did not have a three-way cock at hand, I made one out of an ordinary shut-off cock. A $\frac{1}{16}$-in. hole was drilled through the body of the cock, at A, and into the cross hole of the valve, as shown at B. The position of the valve for running oil to the front bearing is



An Oiling System to Take the Place of Wick-Oiling the Bearings on an Automobile

shown at C, and to the rear bearing, at D, while E represents its position when the oil is entirely shut off from both bearings.—Contributed by L. L. Llewellyn, Hayward, Cal.

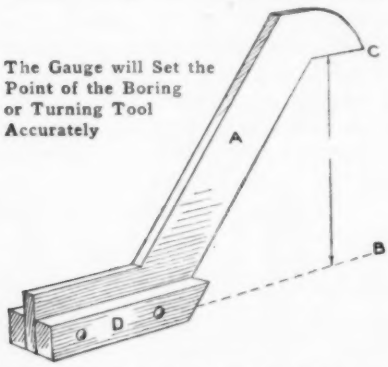
Filler for Metal Surfaces

In finishing a piece of machinery, use a filler as follows: Dry filler, 6 parts; whiting, 3 parts; lead in oil, 3 parts, and pulverized silica, 6 parts.

Make this into a paste with a liquid composed of 3 parts of rubbing varnish, 2 parts of coach japan, and 1 part of turpentine, all by weight. Mix to a stiff paste and run through a paint mill, or work up on a slab. Fill the surface of the metal with the paste, and when it has become dry and hard, rub smooth with fine sandpaper. If it is desired to have a darker color add some lampblack. Thinned, the filler can be used as a paint for iron.

Centering Gauge for Lathe Tools

The gauge shown is a recent addition, and one of the handiest in my kit. The usual way for turning tapers, no



matter whether the lathe has a taper attachment or not, is to cut in with a parting tool to the size at both ends of the taper, then setting the lathe until a small scale has the correct "feel" between the parting tool and the taper sizes. When a heavy piece of work is between centers it is difficult to set the tool exactly at the center of the stock, which is absolutely necessary for accurate work either in setting or turning, without removing the work and setting the tool to the lathe center. This gauge will overcome these difficulties and can be used also for boring, which is the hardest job of the two for tool setting.

The body, A, of the gauge consists of a piece of ⅛-in. soft steel and the distance from the base line B to the point C is the same as from the top of the tool rest to the lathe center. The base may be reinforced with ⅛ by ⅜-in. strips, as shown at D, to rest firmly on top of the tool rest. In setting a tool for cutting or turning tapers, the top or cutting edge is placed under the point C. For boring, the gauge is set on the tool rest and up against the work and marked with a scriber, then the boring tool is set to the line before starting the lathe head.—Contributed by G. O. Reed, Stratford, Can.

Covering Capacity of Paint

To ascertain the amount of white-lead paint required to cover a given surface of wood, divide the number of square feet by 200, which will give the number of gallons of mixed paint required for a two-coat job. It is usually estimated that a gallon will cover 500 sq. ft. of average wood or smooth metal surface one coat.

The number of pounds of keg white lead required to cover a certain area is found by dividing the area in square feet by 18, which will give the number of pounds of lead required for a three-coat job.

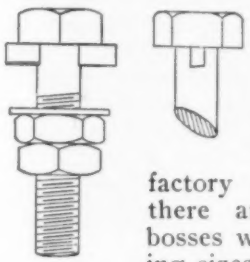
Exclusive of glass, the paint materials required to do an average dwelling will be from 20 to 30 per cent of the total cost of the painting. The labor will be the largest portion.

Blue Ground for a Level Bubble

The bubbles in level glasses, set directly into the plaster-of-Paris bed, are difficult to see in some of the many positions the level is necessarily held while in use. The sketch shows an excellent way to set a glass so that the bubble will show up clear and plain in any position the body of the level may be held. Just before the glass is pressed into the plaster a thin strip of dark blue paper is wrapped halfway around the glass on the under side and pressed into place with the glass.—Contributed by F. W. Bently, Jr., Milwaukee, Wis.

Hand Tool for Facing Small Bosses

For machining small bosses where power is not available, or cannot be used owing to the location of the boss on the machine, a tool similar to that shown in the sketch will be found to accomplish the work in a very satisfactory manner. Where there are a number of bosses with holes of varying sizes it is best to have bolts turned to fit the holes, but the same facing cutter may be used for bolts of different sizes, and by the use of bushings, one bolt may be used on several different-sized holes.



The tool shown was made to face a boss, $1\frac{5}{16}$ in. in diameter, with a $\frac{5}{8}$-in. hole through it. It consists of a $\frac{5}{8}$-in. hexagon-head turned bolt with a slot under the head to take a $\frac{1}{16}$ by $\frac{3}{8}$-in. tool-steel cutter, backed off on opposite sides, at the ends, for clearance. A washer and two hexagon nuts with rounded corners complete the arrangement. The nut directly beneath the washer is the feed, while the function of the locknut is to prevent the bolt from turning in the feed nut, and from jamming when the wrench is applied to the bolt head.—Contributed by J. A. Shelley, Brooklyn, N. Y.

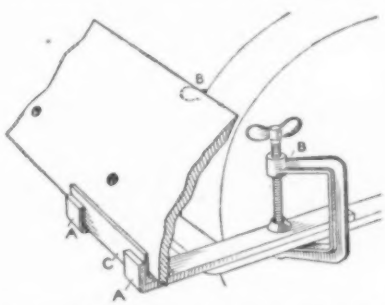
Black Varnish for Leather

A varnish for use in making a mixture to coat leather black, so that it will not break by rough handling, is as follows: Equal quantities of turpentine, turpentine oil, and resin are mixed together, 30 parts each. Then 6 parts of sandarac gum and 120 parts of shellac are added, whereupon the whole mixture is dissolved in 900 parts of 90-per-cent alcohol. The liquid thus prepared is filtered and then 15 parts of fine lampblack, previously dissolved in a little alcohol, is thoroughly mixed in it. Apply with a soft rag.

Grinding Machine-Cutter Knives without Special Machinery

The knives used on paper cutters, wood planes, in leather work, etc., require a special machine for grinding. They must have a keen, straight edge, preferably a little hollow ground. The grinding machines are expensive, and as their field of usefulness is limited, they are seldom found except where much of this work is being done. However, with the rig described, such knives can be well ground on any emery wheel, or grindstone, having its bearings well fitted and being of a grade adapted to some form of tool grinding. Theoretically, the only proper wheel is the one of the grit and grade for knives, but, with care in not overheating, any wheel can be made to do the work.

Take two pieces of flat iron, A, say $\frac{1}{2}$ by 1 in., bend a hook on one end of each and clamp them with C-clamps, B, one on each side of the wheel, to the frame of the machine. Procure a piece of angle iron, C, of any size, and lay across the two bent ends. Place the knife as shown, and grasping its back with a hand at each end, feed it back and forth across the wheel's face. If the pieces A are set about right, the weight of the blade will furnish sufficient pressure to grind without bearing



Holder for Grinding Machine-Cutter Knives on an Ordinary Stone or Emery Wheel

down on it and the hands simply move the knife across the stone. If a straight edge is required check it with a straightedge, unless this can be determined with the eye.

To Plane Aluminum Segments

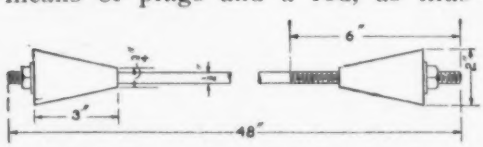
In a certain machine an aluminum band was required. This band being 3⅛ in. wide, 34½ in. inside diameter and 36 in. outside diameter, was cast in four segments. The only finishing required was to cut the width from 3⅛ in. down to 3 in., to smooth the edges and make each segment the same width.

To hold them so that they would not be bent out of shape was not an easy thing, as the light metal was readily sprung. All four pieces were put together on edge on the planer and placed against two angle plates to which they were lightly held with two clamps. Blocks of wood were wedged down in the spaces between the segments in their centers and then the clamps could be tightened sufficiently to hold the cut taken without bending the segments out of shape. After taking a cut on one side a clamp was put on the center to keep the pieces in position while turning them over and until the end clamps were again applied.

For roughing off aluminum use a keen, round-pointed and slightly V-shaped tool. For finishing, say, removing $\frac{1}{100}$ in., use a broad, flat tool, and a highly polished surface will be the result.—Contributed by Donald A. Hampson, Middletown, N. Y.

How to Plug a Boiler Tube

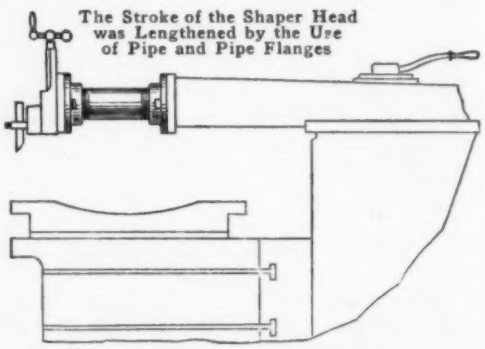
A leaky tube in a fire-tube boiler may be fixed at reasonable cost by means of plugs and a rod, as illustrated. The dimensions given are suitable for a tube length of 40 to 44 in. and a diameter of about 2½ in. Two pieces of cast iron are drilled with a ½-in. drill and then turned tapering on the outside. A ½-in. rod, with a short thread on one end and a longer thread on the other, is provided. One plug is driven into each end of the leaky tube, the rod is put in and the nuts are tightened. A little asbestos packing is of advantage. Other sizes may be made in proportion. A tube plugged in this manner will last for years, but it should, nevertheless, be taken out and replaced at the first opportunity, for the plugs are only intended as a temporary repair.



Tapered Cast-Iron Plugs and a Rod Used to Stop Up a Leaky Boiler Tube

Lengthening the Stroke Limit of a Shaper Head

A small shop with limited equipment but doing a great variety of general work is the birthplace of a great many ingenious methods for getting the work out in spite of innumerable obstacles. One small shop possessing a shaper with a limited stroke had a job of machining the bottom faces of a large crossyoke. The side toward the head of the shaper could be reached readily, but the head could not be thrown forward far enough to finish a cut on the opposite side of the yoke. It was impractical to shift the work in the chuck, as it was necessary to have the faces of the cuts true. The method used to overcome the difficulty was a last resort to prevent the job from going to another shop, and was very practical.



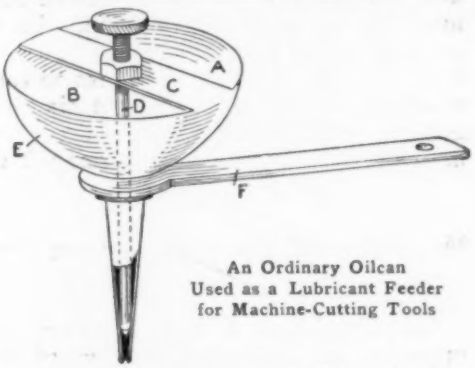
The Stroke of the Shaper Head was Lengthened by the Use of Pipe and Pipe Flanges

After the inner side of the yoke had been machined, the head of the shaper was removed and again applied after

two pipe flanges and a short nipple had been inserted, thus throwing the head of the shaper ahead of the limit allowed by its construction. The cuts taken were necessarily a trifle lighter to prevent chattering of the improvised head extension, but aside from that the results were very satisfactory. The sketch will readily show how the head was extended by means of the large pipe fittings.

Oil Feed for Machine-Cutting Tools

A simple but good oil feed can be made of an old oilcan, as shown. The



An Ordinary Oilcan Used as a Lubricant Feeder for Machine-Cutting Tools

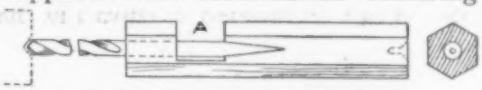
sections A and B are cut from the bottom of the can, leaving the strip C, which is the width of a small-sized nut. The nut is soldered to the center of the strip, and a pin, D, threaded part way, is screwed through the nut, the unthreaded part being filed to a size a trifle smaller in diameter than the threaded part. A piece of sheet iron is shaped as shown at F, and slipped over the neck of the can, where it is held by the spout when the latter is in place. The can may then be attached to any part of the machine for use. Oil or lubricant is poured into the can and the flow regulated by the pin D.—Contributed by Jos. J. Kolar, Maywood, Ill.

Glass Gauge Used as a Ruler

A heavy glass gauge makes an excellent ruler for ink work. In addition to its being transparent, it safeguards against accidental blotting, as any ink adhering to its surface is clearly seen.

Holder for a Center-Clearance Drill

A very simple and handy tool for machinists, especially for those not supplied with combination centering

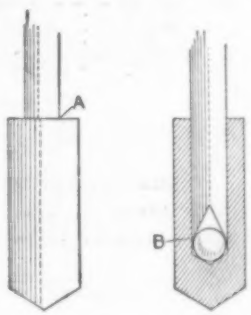


Holder for a Center-Clearance Drill to be Used in a Lathe

drills, is shown in the sketch. The tool consists of a piece of hexagon brass with a notch cut out, as shown at A, a V-shaped opening cut in the center with a hacksaw, and a hole drilled to receive the shank of a drill and a center hole drilled in the opposite end. The hexagon shape affords a ready grip for the hand. The dotted lines show the work when the holder is in position for use after being centered. The straight shank of the drill is ground tapering, like a chisel edge, to fit into the V-shaped notch cut in the holder. —Contributed by John Harger, Honolulu, H. I.

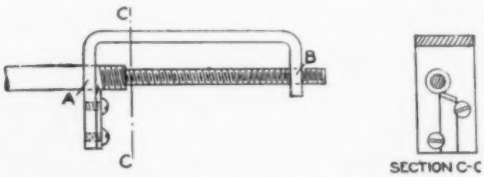
Plunger Repair in an Automobile Gear Box

The plunger which prevents the gears in the gear box of an automobile from any movement broke, as indicated in the sketch, at A. As a new one would cost more than I cared to pay I decided to repair it at home. The repair was made as shown. A piece of hardened drill rod was inserted to replace the broken upper portion and a steel ball was placed between the two pieces. By forcing the two together a firm and secure joint was made, the metal of the upper portion B being forced between the ball and the lower piece. This joint is much better than a threaded joint. —Contributed by Adolph Klein, New York City.



Cutting Special Threads without a Lathe

To make a screw on a rod or shaft of any diameter using only a standard thread cutter, proceed as shown in the



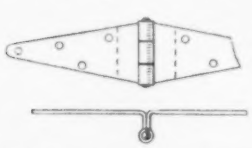
The Standard-Size Threads Make a Feed for the Tool Which Cuts the Threads on the Large Part

sketch. A piece of flat iron is bent and drilled, at A, to receive the shaft, and tapped, at B, with a standard thread of the required pitch. A thread-cutting tool is made of flat tool steel, ground to a 60-deg. cutting point and clamped to the flat iron with two screws, as shown.

The shaft on which the screw is to be made is turned down at the end and a standard thread cut on the end. The shaft is then inserted in the large hole in the flat iron and turned into the threaded hole, which causes a thread to be cut on the large part. A better thread can be made by taking several light cuts. The end with the standard threads is cut off, leaving only the special thread on the shaft.—Contributed by Phillip K. McGall, W. Orange, N. J.

A Hinge to Make a Door Self-Closing

When fastening strap hinges on a barn door it is a good plan to bend the wings of the lower hinge at right angles as shown. This is easily done by gripping the hinge in a vise ⅜ in. or more below the joint, the amount depending on the size of the hinge. A door arranged with a lower hinge of this kind will have a tendency to swing shut at all times.—Contributed by J. V. Loeffler, Evansville, Ind.

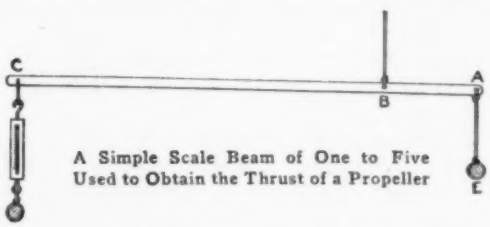


Supplying Drinking Water to Shop Hands

A manufacturing concern found that their men lost about 15 minutes by stopping their machines, laying down their tools and walking to the cooler, located in the center of the shop, for a drink. Sometimes they had to wait their turn, or they would swap a story, walk back and start their work. The cooler was taken out and at regular intervals during the day a boy passed water to the workmen in individual glasses carried in wire trays. They also offered it to everyone in the offices, and it was rarely refused. This practice saved a large amount of time in a year and in addition improved the drinking habits and consequently the general habits of the men.—Contributed by T. F. Webster, Pittsburgh, Pa.

Measuring the Thrust of an Aeroplane Motor

Sometime ago I had occasion to measure the thrust of my aeroplane motor, and as I had no scale large enough, I rigged up the arrangement



A Simple Scale Beam of One to Five Used to Obtain the Thrust of a Propeller

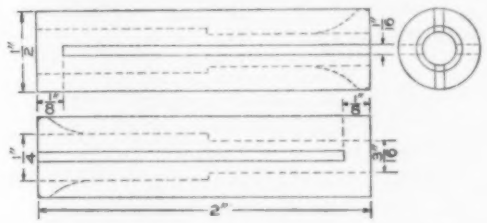
shown in the drawing, making the distance AB 1 ft., and AC, 5 ft. At A, the lever was fastened to the stake E by means of a wire; at B, the wire from the machine was fastened, and a 50-lb. spring balance was attached at C. The reading of the spring balance should be multiplied by 5.

If a larger balance were used it could be moved nearer B with more accurate results, the reading always being multiplied by the number of times AB is contained in AC.—Contributed by Geo. F. Hess, Corvallis, Ore.

Draw Collets for Milling Tools

The milling machine I was using had a draw collet for ½-in. cutter shanks, and as some work required the use of a $\frac{3}{16}$-in. end mill, I had no way of holding them. I therefore made a collet for these mills as follows:

A piece of cold-rolled steel, 2 in. long, was drilled centrally with a $\frac{3}{16}$-in. hole



A Draw Collet Having a Different Diameter in Each End for Small Mills

through its entire length, and then a ¼-in. hole halfway. A slot was cut through the diameter, beginning at one end and extending to within ⅛ in. of the other; then another slot was cut at right angles to the first slot and finishing ⅛ in. from the end in the same manner, only beginning and finishing at opposite ends from the first slot. This formed a double-end socket for $\frac{3}{16}$ and ¼-in. end mills.

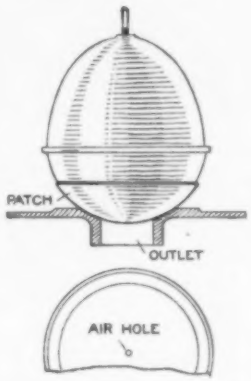
A draw collet can be made in this manner very cheaply, and it has two sizes. The smaller mills have the shank the same size as the cutter, which must have a holder, or else the tool will not run true.—Contributed by Walter Butz, Pearl River, N. Y.

A Substitute Packing Screw

After breaking the last packing screw I had, in an effort to remove some old packing from the gland of a main feed pump, I used the next best thing that happened to be at hand, which was a ⅜-in. lag screw, 6 in. long. This proved to be a better device to remove the packing, as the large thread took a good hold in the soft packing and did not pull out.—Contributed by Edwin M. Davis, Philadelphia, Pa.

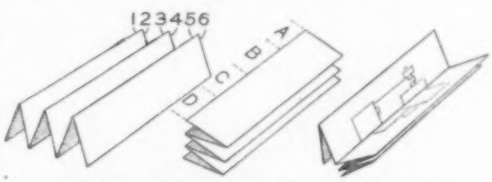
To Repair a Flush-Tank Float Valve

The outlet valve in my closet flush tank leaked badly and when I examined it, the rubber on the under side of the ball was found to be roughened by contact with the outlet seat and let the water through. The repair was made, after turning the water off, by removing the valve and cleaning the roughened surface well with gasoline, then applying rubber cement and a rubber patch larger than the valve seat. This fitted the valve seat smoothly enough to hold the water.—Contributed by W. E. Crane, Cleveland, Ohio.



To Handle Large Blueprints

Experience in handling large blueprints on the drawing board has proved the simplicity of the following method in saving much wear and tear on the prints and greatly facilitating the reference to any part. Fold the print into at least six parts, the folds running from the top to the bottom of the print. The folds can be turned over like the pages of a book, and the whole print occupies so much less space and is so much more easily handled that it can be kept on the drawing board without



Folding and Indexing Blueprints for Ready Reference in Using on a Drawing Board

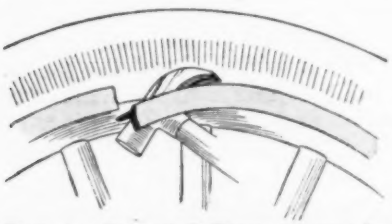
in the least interfering with the work.

To still further facilitate reference where there is much confusing detail,

divide each print vertically into 6-in. spaces, giving each space a letter, beginning at the top with A. Number the folds 1, 2, 3, etc., as if they were pages in a book. By means of simple notes, as A-3, B-6, etc., like the marginal key to a map, this system provides a ready means of finding any desired part easily.—Contributed by J. Harmer Knight, Philadelphia, Pa.

Claw Hammer Used for Detaching a Rim

An automobilist recently asked me to help him remove what he termed a quick-detachable rim from one of the wheels on his car. After watching him try to pry it loose with a screwdriver, I procured an ordinary claw hammer



The Claw on a Carpenter's Hammer Inserted under a Rim will Quickly Remove It

and, inserting the claw in the space he had opened with the screwdriver, easily removed the rim. No doubt it would be a good plan to include a claw hammer in the auto tool box.—Contributed by James M. Kane, Doylestown, Pa.

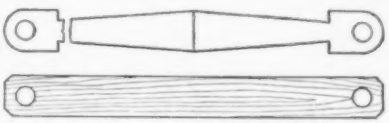
Removing Oil from Marble

In shops it is sometimes desirable to remove grease and oil from marble floors, or marble used in machine construction. An easy and effective way is to apply strong lye and quicklime. Any-strength solution can be made as needed and no matter how strong it may be, it will not injure the marble.

The best method of application is to simply throw on the lye, powder with the quicklime and use some water with a scrub brush. The solution can be kept ready for use and marble slabs can be cleaned daily.—Contributed by Loren Ward, Des Moines, Ia.

Temporary Repair on a Valve-Gear Link

One of my men informed me that one of the larger boiler-feed pumps was disabled, says a correspondent of

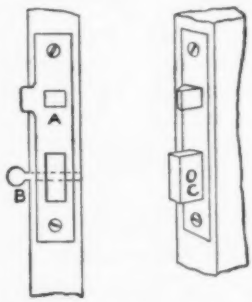


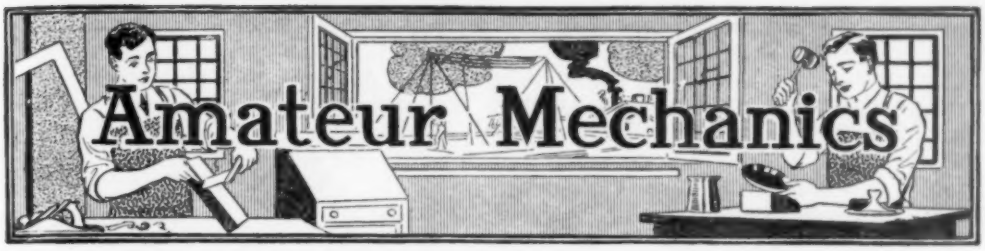
The Broken Link was Removed and One Cut from a Piece of Wood Substituted

Southern Engineer, and it was found that one of the links in the valve gear had been broken. As we had no spare pump at that time, something had to be done, and done in a hurry. Seeing a piece of 2 by 4-in. scantling in the boiler room, I grabbed a saw and soon had a wood link made, as shown in the sketch. In 35 minutes I had the pump running, and this served the purpose until there was time to have a new link made.

A Double Lock for a Door

When a lock is of simple construction and a more secure one is desired an additional safety device can be easily attached to it. The door is closed and the lock bolt turned, then a hole, about ⅛ in., is drilled through the frame of the door, just back of the plate A, passing through the bolt, as shown at C. By this arrangement the door can be secured from the inside with a pin, B, pushed into the hole and through the bolt C. A skeleton key, or other lock-picking devices, cannot withdraw the bolt. The hole in the bolt should be a trifle larger than the pin and countersunk slightly on both sides to allow for any slight movement out of line.—Contributed by Joseph J. Kolar, Maywood, Ill.



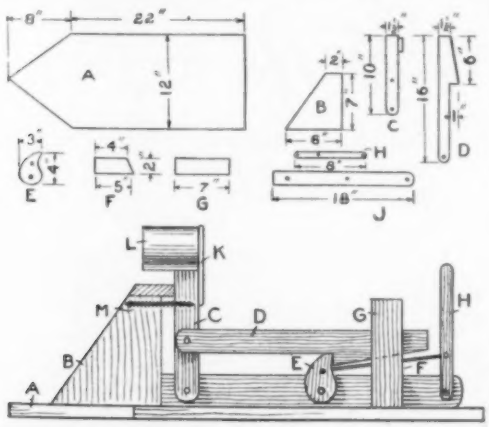


A Snowball Thrower

By ALBERT BATES, Jr.

The snow fort with its infantry is not complete without the artillery. A set of mortars, or cannon, placed in the fort to hurl snowballs at the entrenched enemy makes the battle more real. A device to substitute the cannon or a mortar can be easily constructed by any boy, and a few of them set in a snow fort will add greatly to the interest of the conflict.

The substitute, which is called a snowball thrower, consists of a base, A, with a standard, B, which stops the arm C, controlled by the bar D, when the trigger E is released. The tripping of the trigger is accomplished by the sloping end of D on the slanting end of the upright F. Sides, G, are fastened on the piece F, with their upper ends extending above the bar D, to



The Dimensioned Parts and the Detail of the Completed Snowball Thrower

prevent the latter from jumping out when it is released by the trigger.

The trigger E is tripped with the handle H, connected to the piece J, on which all the working parts are mounted. The upper end of the arm C has a piece, K, to which is attached a

Cannonading a Snow Fort with the Use of a Snowball Thrower

tin can, L, for holding the snowball to be thrown. A set of door springs, M, furnishes the force to throw the snowball.

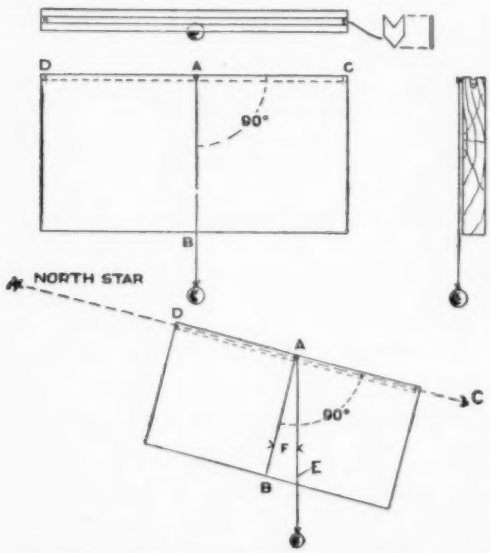
All the parts are given dimensions, and if cut properly, they will fit together to make the thrower as illustrated.

Springs on the Chains of a Porch Swing

Two coil springs of medium strength placed in the chains of a porch swing will make it ride easier and also take up any unpleasant jars and rattles occasioned when a person sits heavily in the swing. If the swing is provided with a four-chain suspension, the springs should be used on the two rear chains to get the best results.—Contributed by E. K. Marshall, Oak Park, Illinois.

A Simple Sextant

A sextant for measuring the latitude of any place can be easily constructed as follows: While a board, 1 in. thick, 6 in. wide, and 12 in. long is about right for the instrument, any dimensions can be used, providing the line AB is at perfect right angles to the level of the sights C and D. The sights are better to use, although the upper edge of the board, if it is perfectly straight, will do as well. If it is desired to use sights, a slight groove is cut in the upper edge; a V-shaped piece, cut from tin, is fastened at one end, and a small pointed nail is driven in at the other. In doing this, be sure to level the bottom of the V-notch and nail point so that in drawing the line AB it will be at perfect right angles to a line between the sights. A tack is driven into the side of the board at the upper edge, a line fastened to it and a weight tied to the lower end which should swing below the lower edge of the board.



The Main Part of the Instrument Consists of a Board with a Plumb Attached

The instrument is placed in such a manner that the North Star is sighted, as shown, and the point on the lower edge of the board is marked where the line E comes to rest. A line is then drawn from A to the point marked and the angle F is measured with a protractor. The number of degrees in this angle will be approximately equal to

The Two Stars at the End of the Great Dipper are Pointers to the North Star

the number of degrees in the latitude of that place.

The North Star is easily located by reason of its position relative to the Great Dipper, as shown by the diagram.—Contributed by Carlos Harrison, Anderson, Ind.

How to Make a Taper Ferrule

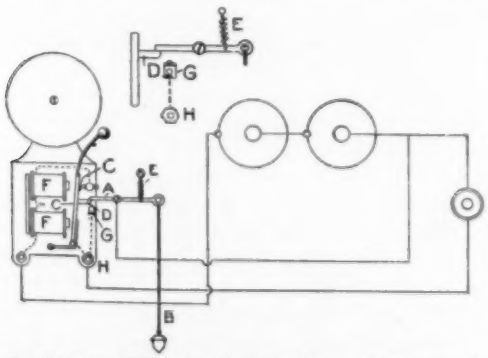
Having occasion to make a taper ferrule of irregular form, a pattern from which to cut the material was made as follows: A mandrel of the desired shape was made, a piece of writing paper, soaked in water, wrapped around the mandrel, and a piece of twine wound over it, coil after coil like the thread on a spool. This was allowed to dry thoroughly, using a little heat. The string was then removed and a longitudinal cut made in the paper while on the mandrel. When opened this paper formed the pattern.

A piece of metal was cut from the pattern and the edges were brought together and brazed with spelter. The point of the mandrel was driven through a piece of block tin, about ½ in. thick. The mandrel was then removed, the ferrule was placed on it, and both then started in the hole made in the tin and driven through it. As the mandrel with the ferrule passed through the tin, the metal was shaped exactly to the mandrel. It is best to oil the hole in the tin slightly. Tin is preferable as it is harder.—Contributed by James H. Beebee, Rochester, N. Y.

How to Make a Continuously Ringing Bell

The bell shown in the accompanying diagram is known as the continuously ringing type, and has quite a field of usefulness in connection with burglar alarms, door-bell signals, telephone signals, etc. The operation of the bell proper is identical with that of the ordinary vibrating bell and, in addition, there is a circuit controlled by the armature of the bell, which is normally open, but becomes closed as soon as the armature is drawn over. The closing of this circuit by the operation of the armature amounts to keeping the push button in the bell circuit depressed, and the bell will continue to ring until the latch A is restored by pulling the cord B.

Any ordinary vibrating bell may be converted into a continuously ringing bell as follows: In the armature, C, mount a short metal pin, D, and round off its under side slightly. A latch, A, should now be constructed similar to the one shown in the sketch and mounted in such a position that its left end will rest on the outer end of the pin D when the armature, C, of the bell is in its extreme outer position. The length of the latch should be such that its left end will drop off the end of the pin D, due to the action of the spring E, when the armature C is drawn over

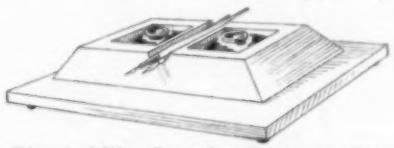


An Ordinary Vibrating Bell Used as a Continuously Ringing Bell, and the Wiring Diagram

by the electromagnets F, thus allowing it to come into contact with a spring G, which is electrically connected to the terminal of the bell marked H. The latch A is connected to one side of the line, as shown in the sketch, so as to include the bell winding and battery in a local circuit that is formed by the latch coming in contact with the spring G. The end of the latch should not interfere with the free operation of the armature when it is resting on the spring G. A cord, B, attached to the outer end of the latch, is used in restoring it, and at the same time stopping the bell from ringing. The tension in the spring E should be so adjusted that the operation of the latch is sure and firm, yet not too stiff.

A Mission-Style Inkstand

Having a couple of good-sized ink bottles of the ordinary type lying



Two Pieces of Pine Shaped to Receive the Inkwells and Finished in Mission Style

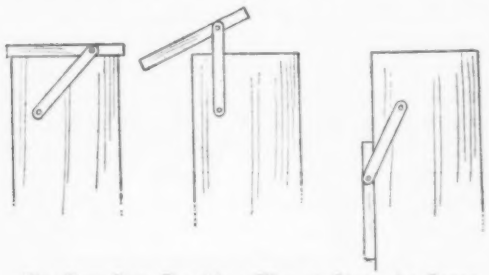
around, I fashioned a mission-style stand for them out of a piece of yellow pine, 2 in. wide and 3 in. long, set on another piece of pine large enough to project all around on all four sides of the block, for a base. The wells were cut out with a wood chisel, and the parts fastened together with screws. The supports were four brass-head or upholsterer's tacks. The finish was flat black.—Contributed by James M. Kane, Doylestown, Pa.

Raising Dents in Wood

The imprint of a hammer on finely finished wood caused by a glancing blow, or otherwise, may be removed in the following manner: Pour enough wood alcohol on the dented spot to cover it, then light the alcohol and allow it to burn out. The heat will expand the wood and raise it enough so that the spot can be planed and smoothed in the usual manner.—Contributed by W. F. Elwell, Waltham, Massachusetts.

Hinge with a Wide Swing

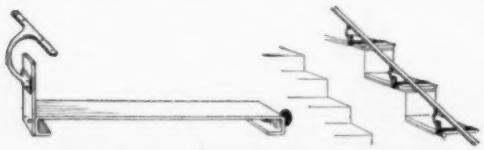
In constructing a box I needed a hinge that would carry the cover farther away from the top than the ordinary double-leaf hinge. I found that two pieces of ¼ by ⅝-in. wrought iron, attached in the manner shown, answered the purpose. By using round-head screws it was unnecessary to countersink the metal.—Contributed by James M. Kane, Doylestown, Pa.



The Two Bars Provide a Way to Carry the Cover Away from the Box

A Detachable Clamp for Stairway Handrails

The sketch shows a handrail clamp, or holding device, which is detachable, for use on stone stairways in the winter when there is ice or snow on the steps. The clamps are made of $\frac{3}{16}$-in. strap iron, of any desired width, conforming to the shape of the balustrade and provided with a hook at either end. To the inside end of the band an upright is riveted and to this upright is riveted an ordinary handrail holder to take the handrail. A heavy thumb screw allows the clamp to be fastened firmly to the balustrade at the outside.



A Detachable Handrail for Use on Stone or Concrete Stairways during Winter

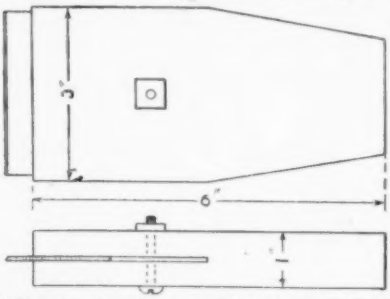
This is a simple and inexpensive device which affords protection against falls.—Contributed by John De La Mater, Chicago, Ill.

A Homemade Leather Punch

An empty bottle-neck rifle cartridge can be easily made into a leather punch by grinding the edge of the opening sharp and cutting a hole near the top in one side. The hole is for removing the leather slugs and should be just a little larger in diameter than the inside diameter of the shell. The cartridges can be had in various sizes and almost any size of punch can be made.—Contributed by Merhyle F. Spotts, Shelby, Ohio.

A Wood-Scraper Handle

In using a plain scraper on the surface of wood the task grew exceedingly tiresome and I lightened the tedious work to some extent by making a handle for the scraper. The handle consisted of a piece of wood, 1 in. thick, 3 in. wide, and 6 in. long. A cut was made in the edge of the wood the width of the scraper blade and about 3 in. deep, and a bolt run through a hole bored centrally in the side, about



A Handle Attached to a Plain Scraper Blade Makes the Work Much Easier

2½ in. from the lower edge. The blade was clamped in place with the bolt.—Contributed by J. D. Keiley, Yonkers, New York.

Polishing Gunstocks

The fine polish applied to gunstocks and wood parts of tools will not wear well, and if one cares for a fine finish, a much better and more durable polish can be applied as follows: Soak the wood in linseed oil for a week and then rub the surface with an oil-soaked cloth for a short time every day, for a couple of weeks.

Electrical Heating Apparatus for the Home

By ARTHUR MOORE

Part I—A Three-Heat Electric Pad

There is, perhaps, no electric-heating device on the market at the present time that will give the user better satisfaction or more solid comfort than the electric heating pad. This device, as all others heated by electricity, depends upon the heat generated in a wire when there is a current of electricity in it; and the amount of heat, thus generated, depends upon the value of the current and the resistance of the portion of the wire considered. In this particular device the heat generated in any portion of the circuit should not be such that there is any likelihood that cloth or other combustible material in contact with the wire be set on fire.

In brief, the heating pad described consists of a piece of specially insulated resistance wire, sewed between two pieces of muslin and provided with the necessary protection devices to prevent any serious damage that might result from short circuits or the restraining of the heat in the pad to such an extent that its temperature may become dangerously high.

The first, and as a rule the most difficult, thing to be procured in order to construct a heating pad is the wire that is to form the heating element. There are, at present, numerous kinds of wire on the market that might be used, if it were not for the fact that the wire must have an insulation of asbestos, or other suitable material, which will not easily catch fire. The heating element, in a pad constructed by the writer, was made of what is known as heating-pad wire, it being manufactured by several companies especially for this purpose. In this heating-pad wire, the bare resistance wire is wound around a core of asbestos, about $\frac{3}{32}$ in. in diameter, the turns being approximately $\frac{1}{16}$ in. apart, and outside of this an asbestos insulation is either woven or twisted on. Almost all heating pads now on the market are constructed of wire made up in a similar manner. The wire used by the writer had a resistance of 23 ohms per foot and was about $\frac{5}{32}$ in. in diameter, outside the insulation.

The amount of wire necessary depends upon the resistance of the circuits, and the size of the wire upon the current it is to carry.

In order that the degree of heat

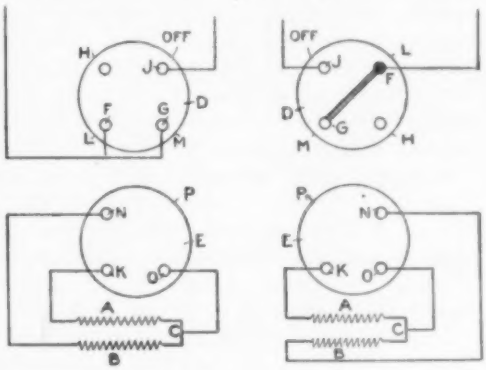


FIG. 1 FIG. 2

Connections of the Heating Elements to Produce Three Changes of Heat in the Pad

generated in the pad may be varied, some simple arrangement must be provided to change the watt-input to the pad by altering the connections of the wires forming the heating elements. Such an arrangement, by means of which three heats may be obtained, is shown diagrammatically in Fig. 1. The heating element is divided into two equal parts, A and B. These two parts are joined at the point C, and three leads extend, from the point C and from the extremities of A and B, to a special switch, as shown in the upper part of the diagram. This switch consists of two cylindrical pieces, D and E. Four holes, three of which have metal clips in them, are provided in D, and three projecting lugs are provided on the piece E. The metal clips are indicated by the letters F, G, and J, and

the three lugs by K, N, and O. These clips and lugs should be mounted in the exact corners of two squares of exactly the same size, so that the lugs on the piece E will enter the clips mounted in the holes in the piece D. The three leads from the resistance element are connected to the lugs in the piece D, and the two leads from the source of energy are connected to the clips in the holes in the piece E, as shown.

By an inspection of Fig. 1 it will be seen that, if the piece D be placed directly over the piece E, the circuit will not be completed through any portion of the heating element, because the terminal of the circuit, from which energy is to be derived, that is connected to the clip J is not connected to any part of the heating element. If, however, the piece D be turned through 90 deg. in a clockwise direction, and then placed over the piece E a circuit will be established through both the resistances A and B. Turning the piece D through another 90 deg. in the same direction connects the two resistances in series, and when the piece D is turned through the next 90 deg. the resistances B is in circuit alone. If the resistance of the elements A and B are the same, the total resistance in circuit, for the positions of D with respect to E mentioned, will be as follows: When the two resistances are in parallel, their combined resistance is equal to one-half the resistance of either of them, and when the two are in series, their combined resistance is equal to twice that of either of them. The resistance of the circuit is a maximum when the two elements are in series; it is one-half this amount when a single resistance is in circuit, and one-fourth of the series resistance when the two elements are in parallel. If the voltage impressed upon the circuit in the three cases is the same, the current for the parallel connection will be four times that for the series connection, and the current with the single resistance will be twice that for the series connection. The watt-input to the circuit for the parallel connection will be four times that for the series connection, and with the single resistance the watt-input will be twice that for the series connection.

The maximum input to the ordinary heating pad is usually in the neighborhood of 66 watts, the size of the pad being approximately 12 in. by 15 in. This input of course corresponds to the parallel connection. For the single resistance, it would be 33 watts, and for the series connection, 16.5 watts.

A connection that will give a better gradation of heat for the three positions of the switch is shown in Fig. 2. In this method of connecting the resistances, they are used singly and in parallel. The resistances A and B should be in the ratio of one to two. Some difficulties will be experienced in constructing the pad if the same size of wire is to be used for both A and B, as they will be of unequal length and cannot be placed side by side. This difficulty can, however, be overcome by using two wires in parallel, permanently connected together, for the lower of the two resistances.

Assuming that the watt-input to the heating pad to be constructed, for the three different heats, are to be 22, 44 and 66 watts, respectively, proceed to determine the values of the resistances A and B. The current in the three cases will be .2, .4 and .6 ampere, respectively, if the voltage is 110, and the resistances will be 550, 275 and 183 ohms, respectively. The 183 ohms is the combined resistance of the 550-ohm element and the 275-ohm element in parallel. For the connections shown in Fig. 2 the resistance A should be the larger. The wire used by the writer was a No. 32 gauge, and had a resistance of 23 ohms per foot, so that $\frac{550}{23}$, or 24 ft. were required for the high-resistance element, and a like amount for the low-resistance element, since it was composed of two wires in parallel which gave a circuit of the same length in both cases. It is not necessary to use more than 12 ft. in the low-resistance circuit, but in this case extra

loops should be made in the longer circuit when they are being fastened in the pad.

If the wire obtained has a different resistance per foot than that given above, the proper change should be made in the lengths ordered.

The construction of the pad proper is as follows: Having procured the wire, next obtain four pieces of rather heavy unbleached muslin, two pieces of bleached muslin, and two pieces of "iderdown;" all approximately 13 in. by 16 in. Start with the two pieces of resistance wire near the center and

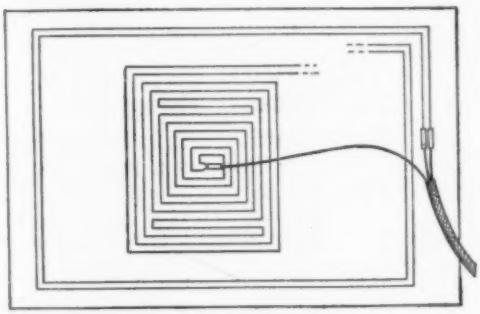


Fig. 3
The Arrangement of the Heating Element in the Pad So That No Part Touches Another

baste them on one of the pieces of unbleached muslin, about as shown in Fig. 3. Several extra loops should be made in the longer piece so that both pieces will terminate at the same point. It may be necessary to repeat the above operation several times before the proper distribution of the two circuits can be made. Both pieces of wire should be thoroughly inspected along their entire length before they are fastened to the muslin, to make sure that there are no blemishes in the insulation. When satisfied with the arrangement of the two circuits, a second piece of unbleached muslin should be placed on top of the wire and stitched to the under piece of muslin, all the way along between the wires. The ends of the resistance wires should be brought out through holes made in the upper piece of muslin, and allowed to protrude about 1 in., and the two pieces of muslin securely bound together around the edges.

Obtain a piece of three-conductor lamp cord, about 3 ft. long, and remove the outside insulation for a distance of approximately 8 or 9 in. Join the inside ends of the resistance wires to one conductor of the cord, at the end where the insulation has been removed. Cut off about 5 in. of the other two ends and join them to the outside terminals of the resistances. Some difficulty will be experienced in trying to solder the resistance wire, and it will be best, perhaps, to just twist the ends of the resistance wires and copper conductors securely together and then tape the joint. It would be best also to have the outside terminals terminate, if possible, at the center of one of the short sides of the pad, and to run the cord along the edge to the corner, sewing it fast to the muslin, all the way along, with heavy thread. The outside dimensions of this portion of the pad should be about 11 in. by 14 in.

A muslin bag should then be made from the two remaining pieces of unbleached muslin and fastened over the pad permanently. A second bag should be made from the two pieces of bleached muslin, but an opening should be left in one corner so that it can be easily removed. An outside covering should be made from the pieces of "iderdown," which is also arranged so it can be easily removed.

This completes the heating pad. The special switch shown in Fig. 2 may be made as follows: Obtain two cylindrical pieces of rubber, or other similar insulating material, about 1 in. in diameter and 1¼ in. long. Draw a circle, ⅝ in. in diameter, on one end of each of these pieces, and lay off four points equidistant around these circles. In one piece drill three ⅛-in. holes to correspond to those shown in E. Procure three pieces of brass rod, $\frac{3}{32}$ in. diameter and 1 in. long. Round off one end of each piece, giving it a slight taper back about ½ in., and drill a $\frac{1}{16}$-in. hole in the other end to a depth of ¼ in. Open up the end of the three-conductor cord leading from the heating pad and solder the three ter-

minals in the ends of the three pieces of brass. The insulation around each cord should be bound with a piece of linen thread, close up to the piece of brass. Now shove these pieces of brass up through the holes in the piece of insulation E until they protrude about ½ in. When they are all in place, drill a small hole through the insulation and each rod, in turn, and drive a small metal pin into each of the holes, so that the ends of the pieces are below the surface of the insulation.

Obtain three ¾-in. pieces of thin brass tubing, of such inside diameter that it will not quite slip onto the pieces of brass, before they are tapered. Split each of these tubes a distance back of about ½ in. by means of a fine saw, and solder a piece of lamp cord into the back end of two of them. Next drill four holes, in the remaining piece of insulation D, of such a size that these pieces of brass tubing will fit snugly in them. Shove the pieces of tubing down into these holes so that the end opposite the cord will be about ⅛ in. from the surface of the end of the piece of insulation. Two of these tubes should be connected together by means of a metal pin, driven into a hole drilled through the two tubes and the insulation. The third tube should be fastened in place by a separate pin.

A small metal screw eye should be fastened in the back end of each piece of insulation to be used in anchoring the cords so as to take the strain off the soldered connections. Heavy linen thread may be used for this purpose.

The switch may be made self-indicating by placing an arrow P on the part E, and four arrows on the part D, in such positions that they in turn are opposite the arrow P, as the piece D is placed in its four possible positions. The four arrows on the piece D may be marked "off," L, M, and H, as shown in Figs. 1 and 2, meaning open circuit, low heat, medium heat and high heat, respectively.

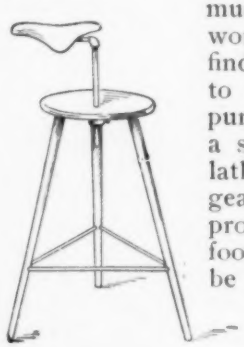
An ordinary plug should be connected to the remaining end of the three-conductor cord and the heater is ready to be tried.

Practically all heaters are equipped with thermostats, mounted in the pads themselves. These thermostats open the circuits, if the heat should exceed a predetermined value, depending upon the adjustment of the thermostats. Space will not permit the description of a thermostat suitable for this particular purpose, but it differs little from any ordinary thermostat, except in point of size. One should be extremely careful in the use of this pad until perfectly familiar with its behavior under all ordinary conditions.

(To be continued)

Combination Workshop Seat

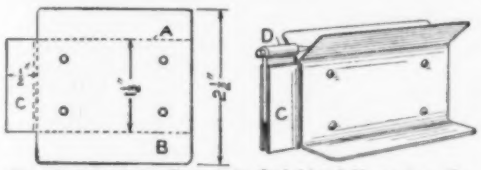
A most practical and satisfactory way of using a stool in a small workshop is shown in the illustration. In much of my small work at the bench I find it an advantage to sit, and for that purpose I purchased a small stool. My lathe is operated by a geared foot motor, provided with two foot levers which may be operated singly in a standing position or both at a time when sitting. The attachment shown converts the stool, the seat of which is too low except for bench work, into a comfortable and neat seat for working at a lathe. The sketch is self-explanatory.



A plate with a setscrew is mounted under the center of the stool seat, through which a hole is bored for the seat post. Two pieces of iron pipe, an elbow and an old bicycle saddle constitute the remaining parts of the device. Provision is made for adjustment as to height, and the position of the saddle may be changed in the ordinary way by using a wrench on the part which grips the horizontal length of pipe, just the same as the seat on a bicycle-seat post is adjusted.

A Prick-Punch Center Gauge

A simple instrument for finding and marking the center of shafting, etc., can be easily made of three pieces of sheet brass and a small prick punch.



The Point of the Punch is Quickly Adjusted to the Center of the Work

Take two pieces of stiff sheet brass, 2½ by 3 in. in size, and cut two corners, ½ in. square, out at one end of each piece as shown in the sketch. Bend the metal on the dotted line A, until it stands at an angle of 45 deg. The part B should be bent up in the same direction, but at right angles to the plate, while the part C should be bent out only slightly. A hole should be drilled near each corner for rivets. Be sure that the two plates are bent in opposite directions, then rivet them firmly together.

Roll one end of a strip of sheet brass, $\frac{7}{16}$ in. wide and 2¾ in. long, into a tube large enough to firmly hold a small steel prick punch. Place the opposite end of the brass strip in between the two ends C. These ends should spring together slightly in order to hold the punch D at any height it may be placed. If accurately made, the point of the punch will be exactly in the center of the V-shaped trough.

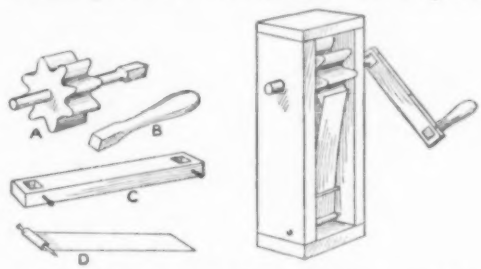
In use, to find and mark the center of a round bar, it is placed in the trough with the end just touching the point of the punch. The brass holding the punch is raised between the parts C until the point of the punch is brought as near to the center of the shaft as can be judged. Press the point of the punch against the end of the shaft and turn the latter in the trough. If the punch marks a circle the center has not been found. This is corrected by slowly moving the punch up or down until the point ceases to make a circle, then the punch is tapped with a hammer to mark the exact center.

A Whirligig Clapper

A good noise maker for Halloween or any other occasion, can be made by carefully following the directions here given. The box is the first thing to make. It is constructed of wood pieces, ½ in. thick, and consists of two ends and two sides. The ends are each 1½ in. square and the sides 1½ in. wide and 6 in. long. These parts are nailed together with the ends lapping the sides.

The ratchet wheel A is a disk of hard wood, 1½ in. in diameter. Its rim is divided into eight equal parts, and notched with a knife as shown. It is placed in the forward end of the box on a wood axle of ⅜-in. diameter to which it is glued. One end of this axle is squared and projects 1 in. beyond the side of the box. The squared end passes through a square hole in the end of the crank C, which is a piece of wood ¾ in. thick, 1 in. wide and 4 in. long, and is fastened with brads and glue. At the other end of the crank, a similar hole connects with a handle whittled to the shape shown at B.

A flat piece of steel spring, ½ in. wide and long enough to reach from the rear end of the box to the teeth of the ratchet wheel, is shaped as shown at D. The spring may be made from a stiff piece of corset steel or bicycle



Detail of the Parts and How They are Assembled to Make the Clapper

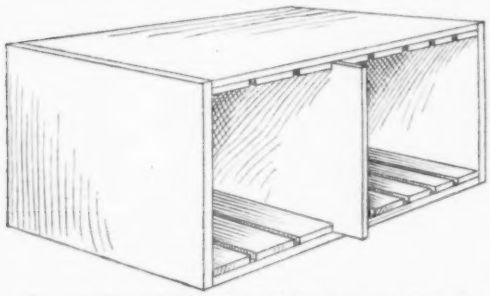
trousers guard. The spring is fastened with a nail through the end and box sides and a second nail passes through the sides over the spring, about 2 in. forward from the first nail. This is to give the spring tension on the teeth.

To operate the clapper, it is allowed

to hang straight down, while the right hand grasps the handle and whirls the box in a circle around to the left.—Contributed by C. C. Fraser.

Box Partitions

As I needed a box with a number of narrow partitions and it was impossi-



Grooves for the Partitions Made with the Use of Small, Thin Strips of Wood

ble to cut grooves for the sections without removing the bottom, I spaced off the places for the partitions with pieces of thin wood and fastened these in place with small nails clinched on the outside of the box. This method was much more rapid and satisfactory than sawing the grooves and cutting them out with a wood chisel.—Contributed by James M. Kane.

Safety Catch for a Flour Bin

A flour bin, counterbalanced to swing closed at all times, is liable to

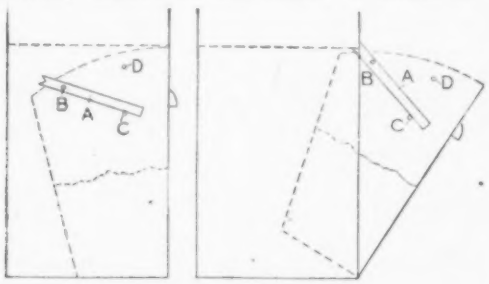


FIG. 1 FIG. 2

Automatically Operated Catch to Hold a Flour Bin Out While Taking Flour from It

catch the arm of the one taking out flour. To make it safe, I applied the device shown in the sketch. The bin, at rest, is shown in Fig. 1. The safety catch consists of a stick of wood, A, notched at one end, and is pivoted at B on a small bolt. Two stops, C and D, are located on the side of the box to prevent the catch from being thrown out of position when the bin is quickly pulled out. These stops are nails driven into the box side. When the bin is pulled out the catch takes the position shown in Fig. 2. The catch stick should be a little shorter than the distance the bin is pulled out, so that it may be raised to release the bin for its return.—Contributed by O. F. Fouche, Erie, Pa.

A Homemade Whistle

Procure two empty No. 30 gauge brass cartridge shells. Cut one shell $\frac{3}{8}$ in. shorter than the other, then flatten and bend them as shown in the sketch. The mouthpiece should be at an angle of 60 deg. File a slot, $\frac{3}{16}$ in. in width, about $\frac{1}{2}$ in. from the end. File off the flange on the shorter shell so that it will fit snugly against the

The Tapering End of a Cartridge Shell is Flattened and Bent to Make a Whistle

side of the other and solder them together. A ring may be soldered on the end of the long shell to fasten it on a chain or string. To give the whistle a shrill sound place a large shot in each shell before flattening them.—Contributed by Peter Veneman, Paterson, New Jersey.

How to Emboss Stationery

A person's monogram or any special lettering embossed on stationery is quite expensive. The engraving of the dies by experts commanding high salaries, and the subsequent presswork necessary to give relief to the design upon the paper cause an expense which the economical person hesitates to accept, much as the refinement and individuality of the embossed work

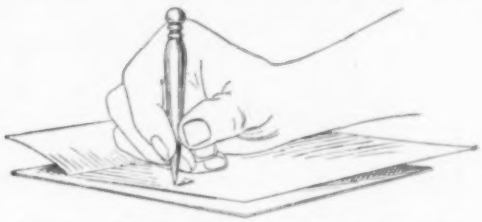
may be admired. But there is a way by which almost anyone may emboss stationery at home with one's own design at no expense whatever. The work is easy and the results pleasing, and monograms or lettering thus done will compare very favorably with the printer's work, especially if there is a good design to follow and the work is done with care. A little artistic ability will, of course, aid one in preparing a design, but is not essential, for the letters required may be cut from printed matter and used as a guide for tracing. There is no limit to the varieties of work possible by this process. Single letters, monograms, words or designs are suitable for reproduction in raised characters.

All the materials required for embossing the stationery are the envelope or paper on which the design is to appear, a stylus and a blotter. The paper should be of fair quality. If it is too thin the stylus point is likely to push through it. The linen-finished papers of medium weight and tough texture give excellent results, although almost any grade of good writing paper can be used successfully. As embossing by this process can be done well only through one thickness of paper, in working on envelopes it is best to put the design on the central portion of the flap, or turn it up and make the design in the left-hand corner of the envelope.

The stylus may be any kind of a pencil-like instrument, easy to grip between the fingers, with a hard, smooth point, rounded slightly so that it will not cut the paper. The ordinary bone stiletto, used in embroidering, makes an ideal tool for this purpose. If this is not to be had, a substitute is easily whittled from a piece of hard wood. Even a wire nail, with its point smoothed with a file, may be used, the upper portion being wound with string to afford a better grip.

The blotter should be white, perfectly clean, and of good weight. A thin, hard blotter will not produce a good raised letter as a softer one will. When the surface of a blotter has become covered with creases from repeated use, it should be discarded and a new one substituted.

As it is best to adopt a distinctive form of monogram or design for stationery and to use it without deviation, it should be selected or worked up with care until something is outlined that will suit. With the design settled upon and drawn on a piece of paper, go over



Manner of Holding the Stylus When Tracing the Design on the Back Side of the Paper

it with a soft pencil to deposit sufficient graphite for an impression. Lay the pattern, face down, upon the back of the paper to be embossed, and directly opposite the spot on the other side where the raised characters are to appear. With the handle of a knife or scissors rub over the back of the pattern till the graphite has left the tracing of the design reversed on the writing paper.

The pattern is now laid aside until required for transferring the design to another sheet of writing paper. Lay the blotter on some smooth, hard surface, such as a desk leaf or table top and lay the writing paper on the blotter, reversed design uppermost. Hold the stylus firmly at an angle as shown in the illustration and keep the blotter and paper from moving with the other hand. Carefully trace the design, using considerable pressure to insure a good relief upon the opposite side of the paper. A soft eraser should be used to remove the guide marks on the back of the sheet when the relief is finished.

After a little practice with a certain design, if it is not too intricate, the operator will find that it can be reproduced quite faithfully freehand, without the use of the pattern, but, of course, the use of the pattern will be the only guarantee of exact duplicates.

INTERESTING NEW PATENTS

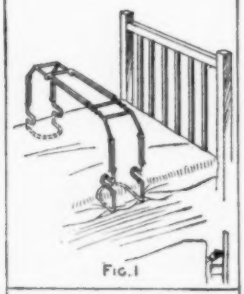


FIG. 1

SUPPORT FOR BED CLOTHING (Fig. 1)—This adjustable frame is intended to support the bed clothing in such a manner that it will not come in contact with the occupant of the bed, and is designed particularly for use in the sick room. It is adjustable for height and can be fitted to any size of bed by means of the sliding connections, as shown. The lower ends of the frame consist of loops which are slipped in between the springs and mattress.

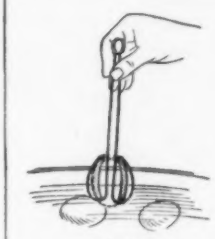


FIG. 2

EGG LIFTER (Fig. 2)—This kitchen utensil is a handy substitute for the spoon or ladle ordinarily used in removing boiled eggs from the boiling water. The metal strips across the lower loops are bent to such a shape as to hold an egg securely.

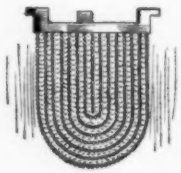


FIG. 3

INCANDESCENT GAS MANTLE (Fig. 3; British patent)—This mantle is to be used in inverted position, as shown, and consists of a series of wire loops on which are threaded beads capable of being made incandescent by the heat of the flame. The wires are suspended from the ring at the top of the lamp and may be braced together by cross wires if desired.

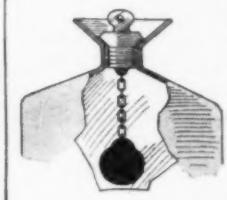


FIG. 4

STOPPER FOR HOT-WATER BOTTLE (Fig. 4)—The interesting feature of this device is the attachment by which the stopper is secured to the bottle and is thus prevented from becoming misplaced or lost. The metal strip suspended from the chain is too large to pass through the neck of the bottle, while the chain is long enough to permit convenient emptying or filling of the bottle.

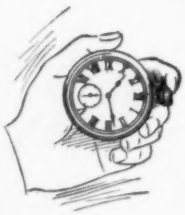


FIG. 5

PISTOL MADE TO LOOK LIKE WATCH (Fig. 5)—The object of this invention is to provide a pistol that can be carried in the vest pocket and that can be presented and fired at a highwayman while apparently obeying his command to "hand over your watch and be quick about it." The muzzle of the pistol is the milled head of what is apparently the winding stem. The trigger is a round bar which slides in a groove and runs back to a point where it engages the hammer. The pistol is fired by pressing the projecting end of the trigger back until it loses engagement with the hammer, as in the usual automatic pistol. In loading, the inner tube of the barrel is removed by turning the milled head, a fresh cartridge is inserted, and the tube is screwed back into place.

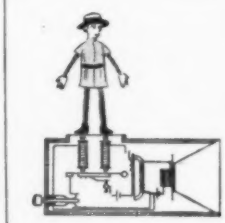


FIG. 6

TOY OPERATED BY SOUND (Fig. 6; British patent to Hungarians)—This is an electrical device operated by the vibration of a microphone placed in the end of the case. Through a system of magnets and circuit breakers a succession of sounds received by the microphone causes the figure to dance.

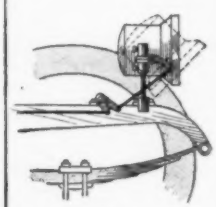


FIG. 7

MOVABLE HEADLIGHT FOR AUTOMOBILE (Fig. 7)—This headlight is so mounted and controlled that the driver can throw the light up or down as desired. Its principal value is in throwing the light down to avoid producing glare in city streets or when meeting another car. The headlight is controlled from the driver's seat.

FIG. 8

SHOE FASTENER (Fig. 8)—This novel form of shoe fastener consists of an arched spring-metal plate provided at each end with a hinged arm which is passed through the opening in the shoe. The arm is curved to fold closely against the under side of the plate.

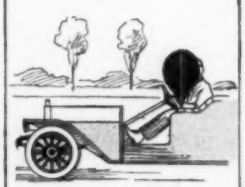


FIG. 9

WIND VANE FOR AUTOMOBILE (Fig. 9; British patent to an American)—One or more of these vanes are placed on a car to counteract the centrifugal force of the car when it is taking a curve. These vanes may be turned to any position by means of a pedal to which they are chain connected.

FIG. 10

ROCKERS FOR BABY CARRIAGE (Fig. 10)—This device for converting a baby carriage into a cradle consists of two grooved rockers with sliding hooks for clamping the rockers to the wheels. The rockers are spaced the right distance apart by crossbars.

FIG. 11

HOLDER FOR COW'S TAIL (Fig. 11)—This holder is designed to prevent a cow from switching her tail while being milked, a deplorable habit to which many milch cows are addicted. It consists of two toothed plates which are clamped to the long-haired part of the tail by means of a setscrew, and an attached strap which is buckled around the cow's hind leg.

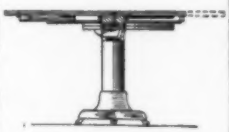


FIG. 13

DEVICE TO PREVENT SNORING (Fig. 12; British patent to a German)—As a rule snoring occurs only when the mouth is open, and this device is intended to prevent snoring by keeping the mouth closed in a manner that will be comfortable to the sleeper. It consists of a collar having a support for the chin and provided with fastenings for attaching to the front and back of the night garment.

FIG. 12

ROUND-TOP TABLE EXTENSION (Fig. 13)—This table is designed to do away with the necessity for inserting detached leaves when the table is to be extended. The extension leaves are hinged to the inner edges of the top sections and are concealed under the top when not in use. When the top is pulled apart the leaves are guided into position by a mechanism consisting of springs and extension arms.

FIG. 15

APPARATUS FOR FILLING TOBACCO PIPE (Fig. 14; British patent to an American)—This filler is cylindrical in form, to fit the bowl of the pipe, and has an opening on one side to which a tobacco pouch is fitted. The cylinder is filled from the pouch and the charge of tobacco is then forced into the pipe bowl by means of a plunger. The plunger is provided with a spring which returns it to its original position as soon as released.

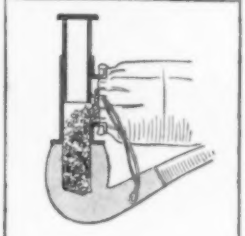


FIG. 14

MIRROR ATTACHMENT FOR AUTOMOBILE GOGGLES (Fig. 15)—The mirror is carried on an arm that holds it at a suitable distance in front of the glass; is adjustable to any position and may be swung up and out of the way if desired. It is intended to take the place of the fixed mirror commonly used to enable the driver to see objects at the rear of his car.

FRAME FOR AIRING BEDCLOTHES (Fig. 16; British patent)—The arms for carrying the bedclothes are attached to the foot frame of the bedstead by means of straps, and are supported on the movable upright by a ring, an arrangement that permits the whole device to be folded compactly when not in use.

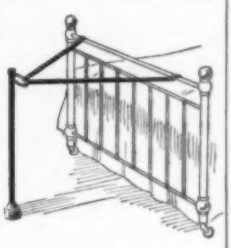


FIG. 16

INFLATABLE HORSE COLLAR (Fig. 17)—The main part of the collar is made of strong and rigid material capable of taking the strain of the pulling, and in a hollow space in the rear is inserted an inflatable bladder so placed as to provide a soft and flexible bearing against the horse's shoulder.

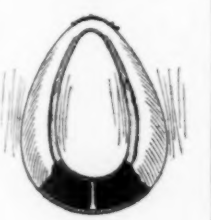


FIG. 17

NEW TYPE OF LIFEBOAT (Fig. 18; British patent)—The object of this invention is to provide lifeboats which, when nested, fit together in such a way that a clear space is left in each boat for the storage of food and water. Each boat has removable seats. The storage space is provided by means of deep keels which hold the boats the required distance apart.

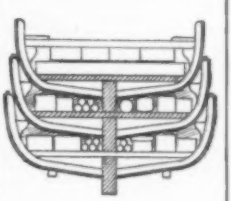


FIG. 18

APPARATUS FOR RAISING SUBMERGED BODIES (Fig. 19; American patent by a Frenchman)—This novel apparatus, evidently intended for raising light bodies, consists of a number of balloons, which after being submerged and attached to the body to be raised, are inflated and made buoyant by air pumped in through rubber tubing. To prevent complete collapse when not inflated each balloon contains a balloonet filled with water.

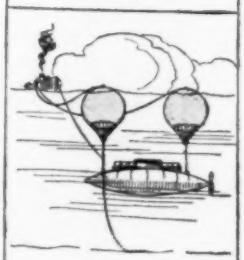


FIG. 19

WINCH FOR CHECKING RUNAWAY HORSES (Fig. 20; British patent by an Austrian)—A trace runs from the winch to an attachment about the middle of the ordinary reins. In case of runaway the driver simply winds up this trace on the winch. A pawl and ratchet wheel prevents back revolution of the winch, but the whole apparatus may be thrown out of action by a hand lever.

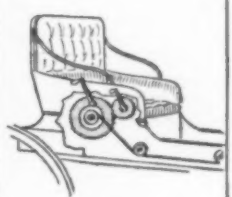
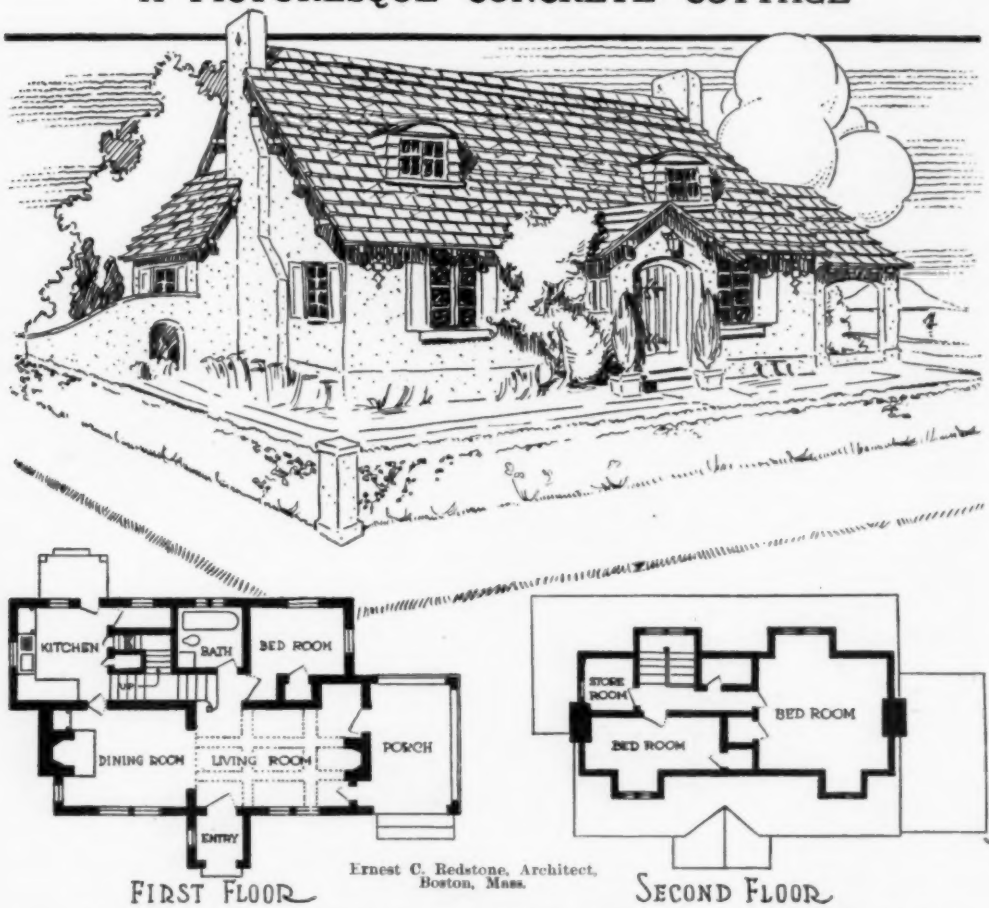


FIG. 20

A PICTURESQUE CONCRETE COTTAGE



Ernest C. Redstone, Architect, Boston, Mass.

A type of dwelling that is evidently gaining in popularity is the small concrete cottage with exterior finish of cement stucco. This type of dwelling lends itself readily to picturesque treatment, a feature that is strongly emphasized in the six-room cottage illustrated above, and is a kind of building that fits particularly well in a suburban setting. In this dwelling, the steep gable roof with dormer windows, the entry and porch in which the gable effect is repeated, the irregular outline of the chimneys, and the extension of the windows up to the eaves, are all features that add much to the general effect.

The first floor contains the living room, dining room, kitchen, bathroom and one chamber, the latter being placed in such a location as to be secluded from the remainder of the floor. No hallway is provided and an economical use of space is made throughout. The compact way in which the stairway is arranged, with approaches from both the kitchen and the living room, is particularly worthy of note. The main entrance leads directly into the dining room, which is a room of unusual size for a building of this type, and to which distinction is given by a heavily beamed ceiling. This room and the living room virtually form one big room extending across the front of the building, being connected by a wide archway. Each is provided with a fireplace, and the arrangement throughout is such as to conform to the picturesque effect of the exterior. The kitchen, while directly connected with the dining room, is entirely separated from the remainder of the floor. Two stairways lead from the kitchen, one to the upper floor and the other to the basement, and between these is placed the pantry. The upper floor contains two chambers and a storeroom. Owing to the arrangement of the stairway, room is available on the second floor for a stair hall that gives ready access to each of the rooms.

The building is of concrete construction with exterior walls of pebble-dashed cement stucco. The color scheme of the exterior is an important feature of the design. The walls are cream colored, the blinds are of yellow green, while the shingles of the roof and the exterior trim are brown. The building is equipped with modern systems of heating and plumbing and is wired for electric lighting. The total cost, fully equipped, was approximately $3,000.